TRET-O-LITE

The Tretolite processes are recognized, wherever oil is produced, as the universal method of treating crude oil emulsions, cut oil, roily oil, and B. S. to pipe line requirements.

COMPANY

Manufacturing Chemists

Science advances . . . methods change . . . materials change . . . what was accepted a short time ago "as the best" is now obsolete . . . more and more is known about the problems that only a short time ago were thought insurmountable . . . and so it is with drilling muds . . .

There is now available a new kind of "jell" mud that mixes readily and surely, and does away with the difficulty encountered in mixing powdered bentonite. It is called

JeloX

JeloX possesses many distinctive features that are not found in any other jell mud. For instance . . .

Easy Dispersion—Jelox mixes with water 20 to 50 times as fast as ordinary powdered bentonite.

Complete Dispersion—The dispersion of Jelox is complete and higher yields result from its use. When powdered or pulverized bentonite is washed into the mud stream from the customary mixing hopper—numbers of agglomerates or clots are formed that are not saturated, and consequently the suspension properties of the jell fluid are lessened to a marked degree. Many operators have resorted to "cooking" to overcome this very objectionable feature of powdered bentonite. Such procedure is unnecessarily expensive and means loss, both of material and time.

IT IS NOT NECESSARY TO "COOK" JELOX

GEO. S. MEPHAM CORP.

SHELL BUILDING
HOUSTON, TEXAS

2001 LYNCH AVENUE
EAST ST. LOUIS ILL.

JELOX

A Colox PRODUCT

THE Petroleum Engineer

MAY 1937

VOLUME VIII NUMBER 8

A MAGAZINE OF METHODS FOR OPERATING MEN

This Issue Contains

DRILLING AND PRODUCTION

	Page
Progress Made in Extinguishing Burning Texas Well By Paul R. Clegg	33
Pressure Maintenace Operations in the South Burbank Pool By J. C. Albright	58
Use of Wire-Line Core Barrels in California By W. A. Clark	70
Drilling the World's Second Deepest Producing Well By Denis S. Sneigr	100
Development of the Mason Field By Jos. A. Kornfeld	116

REFINING AND NATURAL GASOLINE MANUFACTURE

The Stratco PbS Process By D. B. Nutt and J. A. Altshuler	39
Treating Cracked Gasoline Containing Sulphur By J. C. Albright	108

OIL AND GAS TRANSPORTATION

A Soil Survey and Record for Pipe Line Corrosion Departments By Dave Harrell	36
Unusual Method for Cleaning Interior of Pipe Line By H. B. Dempsey	50
Removal of Paraffin from East Texas Gathering Lines By Frank H. Love	52
Laying a Pipe Line by the "Stove-Pipe" Method	78

GENERAL

The Fuel Mixing Problem in the Diesel Engine By Orville Adams	42
Alignment Chart—Capacity of Oil Tanks By F. E. Hangs	83
Forecasting the Oil Demand and Supply By Campbell Osborn	92
The Most Economical Line Shaft By W. F. Schaphorst	122
Factors Affecting the Price of Crude Oil Under a Balanced Economy By J. Elmer Thomas	122B

ENGINEERING NEWS OF INTEREST

A.S.T.M. Issues Specifications for Gasoline	35
Protection of Fresh-Water Horizons in Oil Fields of Kansas	77
Huge High-Pressure Natural Gasoline Storage Tank Being Constructed at Port Arthur, Texas	80
New Plant for Mining and Refining Bentonite	86
Modern Methods Permit of Estimating Oil Field Yield	98
Blow-Outs and Wild Crater Wells Controlled by Engineering Methods	122F
Analyses of Ten Section and Greeley, California, Crude Oils	122H

REGULAR DEPARTMENTS

The Course of Oil	13
Highlights in Oildom	14
Progress of Major Pipe Line Work	16
Latest Acitivities in the Oil Fields	18
Summary of Petroleum Statistics and Field Activities	20
The Month's Activities in Refining	22
Pictorial Petroleum	25
Running Tour with Men in the Industry	124
Laugh with Barney	126
Machinery and Equipment	128, 130, 132, 134, 135, 136, 138, 139, and 140
Trade Literature	148 and 149
Trade Personals	150

Meetings

- Natural Gasoline Association of America, Annual Convention—May 19, 20, and 21, Hotel Tulsa, Tulsa, Oklahoma.
- National Oil Well Superintendents' Association—May 26, 27, and 28, Fort Worth, Texas.
- California Natural Gasoline Association—June 3, Richfield Building, Los Angeles, California.
- American Petroleum Institute, Mid-Year Meeting—June 1, 2, and 3, Broadmoor Hotel, Colorado Springs, Colorado.
- Pennsylvania Grade Crude Oil Association, Annual Meeting—June 10, 11, and 12, on Great Lakes Steamship "Seandbee" sailing from Buffalo, New York.
- Second World Petroleum Congress—June 14, 15, 16, 17, 18, and 19, Paris, France.
- American Society For Testing Materials, 40th Annual Meeting—June 28, 29, 30, July 1, and 2, Waldorf-Astoria Hotel, New York City.
- American Chemical Society—September 6, 7, 8, 9, and 10, Rochester, New York.
- American Gas Association, 19th Annual Meeting—September 27, 28, 29, 30, and October 1, Cleveland, Ohio.
- Oil-World Exposition, Inc.—October 11, 12, 13, 14, 15, and 16, Houston, Texas.
- Independent Petroleum Association of America, Annual Meeting—October 14, 15, and 16, Houston, Texas.
- American Petroleum Institute, 18th Annual Meeting—November 9, 10, 11, and 12, Stevens Hotel, Chicago, Illinois.
- International Petroleum Exposition—May 14, 15, 16, 17, 18, 19, 20, and 21, 1938, Tulsa, Oklahoma.

THE PETROLEUM ENGINEER PUBLISHING COMPANY

Seventh Floor Allen Building DALLAS, TEXAS

C. Morris - - - - *President-General Manager*
J. L. Dwyer - - - - - - - *Vice-President*
W. T. Bryan - - - - - *Secretary-Treasurer*
W. L. Love - - *Vice-President and Adv. Mgr.*
C. R. Barrett - - - - *Circulation Manager*
K. C. Sclater - - - - - - - - *Editor*
Frank H. Love - - - - - *Associate Editor*
Ralph H. King - - - - - *Assistant Editor*

MEMBER A. B. C.—MEMBER A. B. P.

PITTSBURGH, PENN.
Roger Motheral
Eastern Representative
230 Beverly Road
Mt. Lebanon
Telephone: Locust 1500

TULSA, OKLAHOMA
T. J. Crowley
Vice-President
310 Thompson Bldg.
Telephone: 3-0623

LOS ANGELES, CALIF.
R. C. Wipperman
West Coast Representative
1311¼ North Hayworth
West Hollywood, Calif.
Telephone: HEmpstead 1885

Copyright, 1937, by The Petroleum Engineer Publishing Co.

Years OF TRAINING ARE NECESSARY *for* SKILLED PERFORMANCE

Eighty years ago the foundation of A. Leschen & Sons Rope Company was laid. Through the accumulated experience and attainments of these years have come the standards which result in the ultimate achievement . . . the perfectly balanced "HERCULES" (Red-Strand) Wire Lines — the lines which contain the vital elements of Elasticity, Flexibility, Durability, Toughness and Strength—all present to a maximum degree *in balanced proportion.*

When buying wire lines remember these five essential characteristics . . . your selection will be "HERCULES" (Red-Strand) because these lines contain all of them—and all of them in perfect balance.

Domestic Distributors:

CASEY & NEWTON
901 Century Bldg., Pittsburgh, Pa.

GUSTIN-BACON MANUFACTURING CO.
Kansas City
Fort Worth Houston Odessa Tulsa

F. HAMILTON CO., Inc.
Bradford, Pa.

HERCULES SUPPLY COMPANY
Fort Worth Corpus Christi Kilgore

HILLMAN-KELLEY, Incorporated
2441 Hunter St., Los Angeles, California

THE B. LEVY ESTATE
Titusville, Pa.

NORVELL-WILDER SUPPLY COMPANY
Lake Charles, La.
Beaumont Corpus Christi Fort Worth
Houston

PARKERSBURG SUPPLY COMPANY
Parkersburg, W. Va.

STRAKER & TROUT
Mt. Pleasant, Mich.

UNION PIPE AND SUPPLY CO., Inc.
Owensboro, Kentucky

UNITED PIPE AND SUPPLY CORPORATION
Charleston, W. Va. Paintsville, Ky.

UNITED SUPPLY & MANUFACTURING CO.
Tulsa Oklahoma City Stonewall
Chase, Kan. Hutchinson, Kan. Houston, Texas
Odessa, Texas Eunice, N. M.

Export Distributor:

CONTINENTAL EMSCO COMPANY, Inc.
No. 30 Rockefeller Plaza, New York, N. Y.
Branches: Buenos Aires — London — Ploesti

Made Only By **A. LESCHEN & SONS ROPE CO.** Established 1857

5909 Kennerly Avenue, St. Louis, Missouri

New York Chicago Denver San Francisco Portland Seattle

The Course of Oil

By K. C. SCLATER

Divert Development Costs

It has been estimated that in New Mexico 820 wells have developed 317,000,000 barrels of additional reserves of oil. In contrast to these figures West Texas with 2346 wells, or three times as many, has developed only 288,000,000 barrels of additional reserves of oil.

What is an adequate and proper well-spacing program it is not the purpose to go into here, but advancements in the utilization of reservoir energy, the effective use of extraneous energy in maintaining pressure and in secondary recovery processes, are all tending more and more to justify the use of wider well-spacing. The significance of this problem to the industry as a whole is best cited by several estimates and comparisons that have been made recently and set forth in a discussion of the well-spacing problem.

In the old Burbank field, Oklahoma, it is estimated that 900 unnecessary wells were drilled at a cost of $29,000,000 and all because an arbitrary spacing of ten acres per well had been followed. In contrast to this is the South Burbank pool more recently discovered and developed. In this pool it is estimated that following a spacing of 20 acres per well has resulted in a saving of $5,000,000 to the operators. In the latter pool also, a repressuring program for maintenance of pressure was put into operation soon after the pool was developed and will result in a greater ultimate recovery in addition to the savings just mentioned. Not only that, the reduced lifting cost that will result, it is estimated, will more than cover the slight extra cost involved in the pressure maintenance program.

These figures warrant the statement recently made that, "by the additional application of pressure maintenance methods, wider spacing of wells can be justified in the future with enormous savings in drilling and development costs."

Well-spacing is a much more vital problem facing the industry than many are inclined to believe. In the East Texas field alone it is estimated that 12,500 unnecessary wells have been drilled at a total expenditure of $162,000,000. In Oklahoma City 404 unnecessary wells, it has been estimated, have been drilled at a total cost to operators of $46,600,000.

Had the $162,000,000 expended in East Texas for unnecessary wells been used to drill exploratory wells in favorable areas in West Texas 4,000 wells could have been drilled and an estimated 400,000,000 barrels of additional reserves of oil might have been developed. Basing the additional reserves developed per well obtained in the state of New Mexico, these 4000 wells would have added more than one and one-half billion barrels to the reserves of the state.

"Fewer wells and a more thorough utilization of energy are needed to accomplish the maximum benefits of oil pool development." The state and the oil industry will reap these benefits when state regulations recognize that a program of development, and hence an adequate well-spacing program, for new fields should be based on reservoir conditions.

Desalting Interests Producer

A problem that is causing refiners no little concern is the presence of salts in charging stocks. An increase in the use of cracking, together with the employment of higher operating pressures and temperatures, is held to be largely responsible for bringing on this desalting problem, which a few years ago was a comparatively minor one.

Under modern refining methods salts in refinery charging stocks cause grievous troubles and are a prolific source of economic loss. Salts in charging stocks cause corrosion to equipment and usually necessitate frequent shut-downs. To reduce losses arising therefrom the refiner must resort to desalting methods.

There are other aspects of this problem that deserve attention.

Data on this subject disclose that almost all crudes contain salts in appreciable amounts; but what is more important is that the percentage of salts has been observed to be on the increase in many fields. In the East Texas field, for example, samples of oil obtained show that the salt content is increasing rapidly. It is further reported that, "It is also becoming noticeable that the quantity of salt is increasing throughout the Mid-Continent area."

Only recently has the existence of connate water in oil sands gained the attention it would seem to deserve of the production branch of the industry. Advances in the technique of coring and in the examination of cores have awakened production men to the importance of the presence of connate or other water, not with respect to how it affects the refiner, but as it concerns the estimates of oil in a reservoir and related problems. Here is a common problem, then, on which the production man and the refiner might well combine their efforts in overcoming.

Perhaps the method of production in many instances might be modified to reduce the salt content of the crude, or at least to produce the crude in such manner that the problems of the refiner would be lessened. For example, it may be that in some instances, producing crude in the presence of water in certain quantity would reduce the salt content of crude sufficiently to obviate serious losses in refining. It is assumed that the extra cost, if any, of producing the crude thus, would be more than offset by the savings in refining.

In the meanwhile, the production man should recognize the importance of the desalting problem from the refiner's standpoint. By so doing he may be in a position to effect far-reaching economies. There should be cooperation between the production man and the refiner in order effectively to attack this problem at its source.

« « HIGHLIGHTS IN OILDOM » »

May Take Further Action on Elk Hills Oil Land

The naval affairs committee of the United States House of Representatives has ordered an investigation to determine whether further legal action should be taken to recover approximately 23,000 acres of oil lands in the Elk Hills and Buena Vista Hills areas of California. This land has been the center of considerable controversy, the government having filed fraud suits against the Southern Pacific Railroad during the Wilson administration in an effort to obtain a part of the land the railroad had sold to the Standard Oil Company. The courts held against the government, however. No appeal was taken to the supreme court, but members of the committee now express the conviction that further inquiry should be made to ascertain whether all legal avenues have been exhausted.

Chairman Vinson of the house naval affairs committee has appointed a seven-member subcommittee to determine the possibilities.

●

Deep Test Watched with Interest

A test watched with great interest by members of the petroleum industry has been No. 1 Ellender of the Humble Oil and Refining Company, 20 miles south of Houma in Terrebonne Parish, Louisiana. At one time the test gave promise of becoming the world's deepest commercial producing well. At the latest report salt water had intruded.

Drilled to a total depth of 12,165 ft., the hole was plugged back and production obtained from the Miocene formation at 11,620-30 feet. Before water intruded the well was producing at the rate of approximately 40 bbl. of 39-gravity oil an hour through ¼-in. choke.

An interesting feature of the operation was the setting of 12,101 ft. of 7-in. O. D. casing, establishing a world's record. It was 28-lb. 10-thread, Grade D casing and was cemented with 400 sacks of cement. The time required for running and cementing was 24 hours.

The casing program for the well was as follows:

26-in. conductor—40 ft.
20-in. casing—241 ft.
13⅜-in. casing—2841 ft.
9⅝-in. casing (protection string)—8747 ft.
7-in. casing (oil string)—12,101 ft.

●

Crude Output Reaches New High Figure

Crude oil production on May 1 reached the highest figure ever recorded, averaging 3,497,450 bbl., according to information released by the American Petroleum Institute. Despite this sharp increase in production gasoline supplies at refineries, terminals, and in transit declined, due to the heavy spring consumption. Such supplies totaled 82,273,000 barrels. The report of a week later, May 8, showed a slight decline in the daily average production, the total being 3,489,200 barrels.

Modification of Mexican Petroleum Law Expected

According to recent information, President Cardenas of Mexico is expected to order modification of the government petroleum law, limiting government activity to supplying oil and oil products to official and semi-official enterprises only, thus preventing competition with private operators. There has been considerable speculation on this latter point since a general administration of national petroleum was created recently following the expiration of the semi-official Petroles de Mexico. The new agency took over the old company's assets to operate them, as well as any future oil concessions the government might grant the body. At the time it was thought this move might signalize the entrance of the Mexican government into the petroleum business in competition with private interests.

●

Olson Bill Passes Calif. Legislature

The Olson bill, authorizing the drilling of wells offshore at Huntington Beach, California, has been passed by the state legislature and needs only the governor's signature to become law. It provides for leasing the proven area along the waterfront by parcels to the highest bidder. Should there be no satisfactory bids the state can drill the wells. A system of graduated royalties has been provided. Another provision of the bill stipulates the payment of royalties to the state if wells already drilled are found to be producing from the tide lands. The city of Huntington Beach would be given a small percentage of whatever income the state may receive from production from tide lands. This clause was placed in the bill as a compromise.

●

Decline in Bottom-Hole Pressure in Rodessa Field

Bottom-hole pressure on the Louisiana side of the Rodessa field averaged 1822 lb. when the latest tests were made by engineers of the Rodessa Operators' Committee, a decline of 42 lb. during the 31-day period immediately preceding. From July 7, 1936, the decline has been from 2314 lb. to 1822 pounds. Until the latest tests were made bottom-hole pressure had shown but little decline for several months. The rather sharp recent decline in part was due to the fact that all key wells that had been used in the Hill horizon for measurement were discarded and only wells in the Gloyd, Dees, and Young were measured, according to the committee.

●

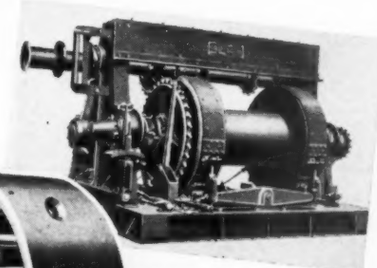
Drilling for Oil in England

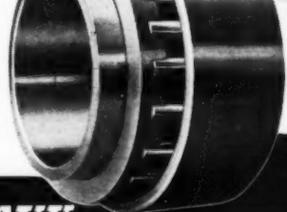
The Anglo-American Oil Company has made a location one mile northeast of Hellingly, Sussex, for the first test well of this company in England. The rig is on Grove Hill, a structure geologists believe suitable for the accumulation of oil or gas. The test probably will be drilled to a depth of 4000 feet.

TWICE THE STRENGTH the job requires

Ewing Galloway, N. Y.

The Wheland Company specifies American Heavy-Duty Roller Bearings for this modern Crown Block and Draw Works. Altogether, 30 manufacturers of heavy-duty drilling equipment standardize on Americans.





No American Roller Bearing application has ever been abandoned.

American Roller Bearings give you an *extra* margin of strength . . . more stamina than even oil-field equipment would really have to have.

Americans are heavy-duty bearings, *specialized* for the oil fields, designed specifically to stand up under the terrific punishment of heavy-duty drilling.

Put RESERVE STAMINA into your drilling equipment, with American Heavy-Duty Roller Bearings. American Roller Bearing Company, Pittsburgh, Pa.

Pacific Coast Office: 321 W. Pico St., Los Angeles, California.

AMERICAN *HEAVY DUTY* **ROLLER BEARINGS**

Progress of Major Pipe Line Work

THE Panhandle Eastern Pipe Line Company has awarded contracts for the loops to its system. For the western section, Liberal, Greensburg, Haven, and Olpe loops, T. R. Jones, Inc., Dallas, Texas, has been given the contract. This will involve the laying of 147 miles of 24-in. pipe, and approximately four and a half miles of river crossings, the latter of 18-in. pipe. For the eastern section, Louisburg, Houstonia, Centralia, and Pleasant Hill loops, the contract has been awarded to E. H. Reeder Construction Company, Dallas, Texas. These loops involve 80 miles of 24-in., 42 miles of 22-in., and one mile of 18-in. multiple-line river crossing. H. C. Price, Inc., Bartlesville, Oklahoma, has been given the contract for electric welding the lines.

Additions to the Liberal, Greensburg, and Haven compressor stations will be made by Stearns-Roger Manufacturing Company, Denver, Colorado. The Fluor Corporation will construct the new station at Tuscola, Illinois, and make the additions to the stations at Olpe, Louisburg, Houstonia, Centralia, Pleasant Hill, and Glenarm.

●

The Oklahoma Natural Gas Company has awarded a contract to the White Deer Pipe Line Construction Company for 20 miles of 10-in. and 18 miles of 8-in. gas line. The line, which will be oxy-acetylene welded by the Lindeweld method, will extend from Crescent to Enid, Oklahoma.

●

Announcement has been made that the Great Lakes Pipe Line Company will replace 100 miles of its 4-in. line between Osceola, Iowa, and Omaha, Nebraska, with 6-in., will parallel its existing 8-in. line between Barnsdall, Oklahoma, and Kansas City, Kansas, with another 8-in., and will lay a 6-in. loop between Des Moines, Iowa, and Minneapolis and St. Paul. On each of the latter two lines one pumping station will be added, while two stations on the Omaha line will be abandoned.

The construction program has for its purpose more flexible operation of the system, as well as to recoup original capacity loss resulting from increased friction losses and decreased throughput caused by drying of the gasoline and roughening of the inside walls of the pipe. This loss is approximately 18 percent. The additions to be made to the system will regain this 18 percent and may add slightly to the line's capacity.

●

The Union Oil Company's pipe line from the South Santa Maria oil field of California to tidewater at Avila has been placed in operation. The line will handle crude from wells of the Union Oil Company, as well as others, the Union, for the present, purchasing the entire output of the field. Many wells in the field were shut in when completed awaiting the construction of the pipe line.

A gas pipe line is being laid from the field to Orcutt where the Union Oil Company has a gasoline plant. It will be completed within a few weeks.

●

Crude Oil Terminal Company is adding two 80,000-bbl. tanks to its terminal at Corpus Christi, Texas. It is announced also that The Texas Company will construct two additional 80,000-bbl. tanks at that point.

American Liberty Pipe Line Company has awarded a contract to the National Supply Company for erection of a pumping station three miles west of Humble, Texas, and approximately halfway between the company's Conroe station and its terminal at Norsworthy on the Ship Channel, Houston. The new station will increase the capacity of the line by 10,000 bbl. daily, D. R. Zachry, secretary of the American Liberty, announces. Actual construction of the station will begin the latter part of May, although already the ground is being cleared and preliminary preparations made.

●

Williams Brothers, Inc., Tulsa, Oklahoma, are laying 12 miles of reconditioned pipe from Eureka, Kansas, eastward for the Stanolind Pipe Line Company. The line is being welded and coated.

●

Construction by the Keystone Pipe Line Company of a 12-in. loop to its existing 8-in. line between Philadelphia, Pennsylvania, and Montello is well under way and is expected to be placed in operation the middle of June. The loop wil be 60 miles in length.

●

H. C. Price, Inc., Bartlesville, Oklahoma, announce they have been awarded the contracts for electric welding and have started construction on the following pipe lines:

From Osage Construction Company, 37 miles of 8-in. in Kansas for the Continental Oil Company.

From Williams Brothers Corporation, 27 miles of 6-in. in Kansas for the Standish Pipe Line Company, to be welded by the stove-pipe method.

From B & M Construction Corporation, 67 miles of 6-in. in Kansas for the Standish Pipe Line Company, to be welded by the stove-pipe method.

From Ford, Bacon & Davis, Inc., 60 miles of 12-in. from Philadelphia to Reading, Pennsylvania, for the Keystone Pipe Line Company.

From Kelly Dempsey Company, Tulsa, Oklahoma, 98 miles of 6-in. in Iowa, for the Great Lakes Pipe Line Company.

From Bechtel Kaiser, Inc., 21 miles of 10-in. in Wyoming for the Mountain Fuel Supply Company.

All lines are to be electric welded using the Fleetweld process.

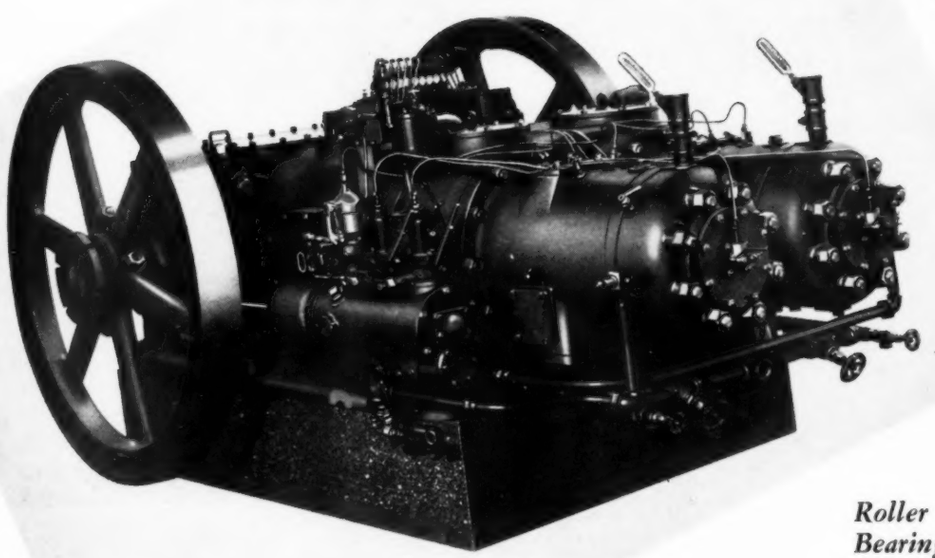
●

McClanahan Pipe Line Company of Mt. Pleasant, Michigan, are now engaged in taking up a 20-mile, 4-in. O.D. welded oil line, which they are relaying in a double, 10-mile line in a new location. This line will transport crude oil from gathering lines of new wells to a larger main line. For this work, they are using 2260 Dresser Style 38 couplings for light-wall steel pipe. Every joint will be Dresser-coupled. Construction is now under way and is being carried forward rapidly by Sylvester Rich, Bradford pipe line contractor. The line is to be buried 18 in. deep and the pressure will vary from approximately 300 lb. to gravity.

Pure Transportation Company, a subsidiary of Pure Oil Company, also is laying some Dresser-coupled gathering lines in the vicinity of Mt. Pleasant at the present time.

THE ANSWER TO YOUR POWER PROBLEM!

TICO TWIN • HORIZONTAL ENGINES



Roller Bearing

STURDILY BUILT...
FREE FROM VIBRATION...BUILT-IN ACCESSIBILITY and SIMPLICITY

Die Forged Heat-Treated Crankshaft for Greater Strength . . . All Machine Parts Interchangeable . . . Available in 13x18 and 14x18 Sizes Convertible to Oil . . 16x18 Size for Gas Only.

Write For New Bulletin Describing Specifications and Construction Details

THE TITUSVILLE IRON WORKS CO.
TITUSVILLE, PENNA.
Division of
STRUTHERS-WELLS-TITUSVILLE CORPORATION

Latest Activities In The Oil Fields

CONSIDERABLE interest has attached to the Tide Water Associated, Seaboard Oil Corporation, Humble Oil and Refining Company's discovery in northeastern Henderson County, Texas. The well, No. 1 McElreath & Suggett, was drilled to a total depth of 7195 ft., ten ft. into the Glen Rose (Trinity) formation. For several hours production was at the rate of approximately 60 bbl. a day, but operators had difficulty completing the well due to stuck drill pipe. It was treated with 3000 gal. of acid, and after being allowed to set one hour, was opened, flowing mud, oil, and wash water for one and one-half hours, then went dead. The well was washed with live crude, but made only about five bbl. of oil daily.

•

Production from a formation new to the Gulf Coast, thought to be the Queen City, has been found by the Republic Production Company and Houston Oil Company's No. 2 Hurd, four miles southeast of the Spurger gas field in Tyler County, Texas. The well was drilled to a total depth of 7641 ft. and washed in, making an estimated 300 bbl. of fluid through ¼-in. choke, 90 percent oil and 10 percent wash water. Oil is 41.6 gravity.

•

The finding of two new pools in Oklahoma has quickened the interest of operators in that state. The Sinclair Prairie Oil Company has opened a new pool south of the Cromwell pool of Seminole County with their No. 1 Rossanna. Production is believed to be from the Simpson Dolomite sand. After being acidized the well flowed 380 bbl. of oil in three hours through tubing. Later, after being shut in for tankage, it flowed 2335 bbl. in 21 hours and 45 minutes.

The Mid-Continent Petroleum Corporation's No. 1 Logan has discovered a pool east of the Shawnee pool and west of the North Earlsboro pool, Pottowatomie County. At a total dept of 4844 ft. the well swabbed 120 bbl. of oil the first 12 hours, producing from the Wilcox sand.

A new field has been proven in the Cantua Creek area, Fresno County, California, by the Western Gulf Oil Company. That company's No. 3 Southern Pacific Land Company, after being perforated between 6459 and 6480 ft., swabbed 459 bbl. of oil and 337 bbl. of water. Production is from the Temblor formation. Oil is 35 gravity.

•

Two new pools have been added to Kansas' constantly growing total. Northwest of the Wiede pool, northern Woodson County, the test of Harry Keene, et al. appears good for 100 bbl. daily, producing from a sand at a total depth of 1552 feet. No. 1 Couch of Ryan Consolidated Oil Company, west of Atlanta in Cowley County, apparently has opened a new pool, as a good flow was obtained from the Bartlesville sand.

•

Harrison Township, Henry County, Ohio, is the scene of a possible new field. N. L. Stevens' wildcat in Section 26-5n-7e made a showing at 1728 ft. when the hole filled 125 ft. with oil. At 1740 ft. the hole filled 360 ft. with oil, and following a shot with nitro-glycerine the hole caved at 1710 feet. At latest reports it was being cleaned out.

•

The world's deepest drilling well, Humble Oil and Refining Company's No. 1 Ellender, Houma field, Terrebonne Parish, Louisiana, has reached a depth of 12,165 feet. Casing has been set at 12,101 ft. and perforated at 12,014 feet. Sands will be tested at that and shallower depths where evidence of oil has been found. If production is not found at those depths the test likely will be drilled deeper.

•

McMillan and DeArmand's No. 1 Maggie Patton, completed flowing 25 bbl. of oil an hour, has extended the Lisbon field of Claiborne Parish, Louisiana, one-half mile east. Total depth of the well is 5293 ft. in the Glen Rose formation. This new field now has a total of six oil wells.

AVERAGE CRUDE PRICES

California	
Kettleman Hills	$1.19-1.43
Playa Del Rey	.80-1.16
Coalinga	.70-.90
Signal Hill	.80-1.21
Montana	1.35
Wyoming	.97-1.30
Colorado	1.12-1.18
New Mexico	.78-1.08
Texas	
North Central	.96-1.20
Panhandle	.91-1.08
West Texas	.78-1.08
Gulf Coast	.95-1.41
Darst Creek	1.09
East Texas	1.27
Talco	.73
Kansas	.98-1.30
Oklahoma	.98-1.30
Arkansas	.90
Louisiana	
Rodessa	$ .93-1.25
Gulf Coast	.84-1.41
North Louisiana	.90-1.22
Illinois	1.35
Kentucky	1.40
Indiana	1.12
Ohio	
Lima	1.25
Michigan	1.42
Pennsylvania	
Bradford	2.67
Southwest	2.42
Eureka	2.37
Buckeye	2.22
Corning	1.32
West Virginia	1.67
Canada	2.10-2.17

DAILY AVERAGE CRUDE OIL PRODUCTION

Data Supplied by A.P.I.

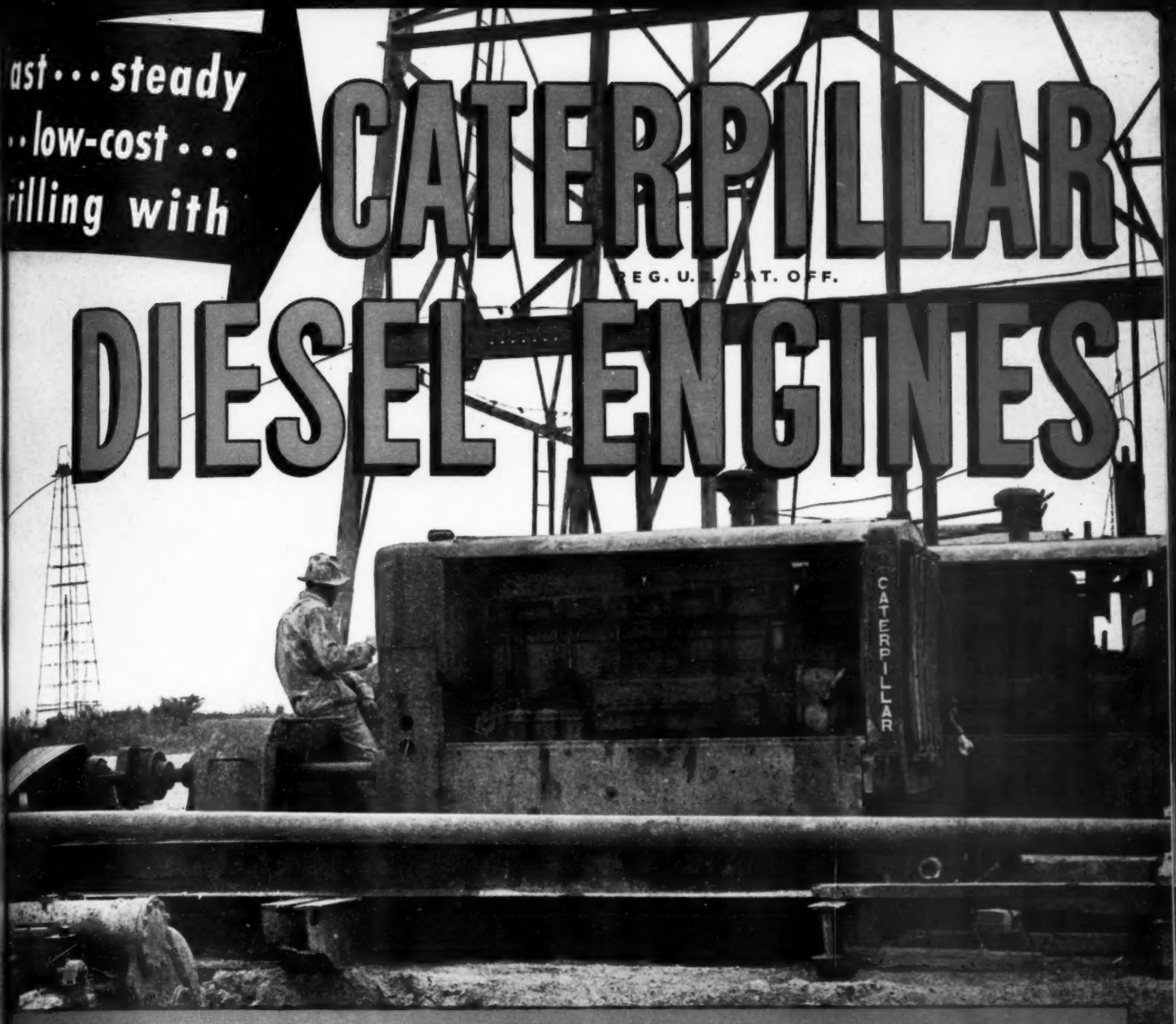
(Figures in Barrels)

	B. of M. Dept. of Int. Calculations (April	Week Ended May 1, 1937	Week Ended April 3, 1937	Week Ended May 2, 1936
Oklahoma	609,600	665,600	648,700	532,000
Kansas	183,000	198,350	189,200	162,600
Panhandle Texas		78,800	75,250	66,150
North Texas		70,550	68,300	59,550
West Central Texas		32,750	33,150	25,000
West Texas		199,600	208,300	181,300
East Central Texas		118,200	123,450	50,350
East Texas		459,250	455,750	448,850
Southwest Texas		229,350	224,350	144,750
Coastal Texas		199,400	208,750	182,550
TOTAL TEXAS	1,297,900	1,387,900	1,397,300	1,158,500
North Louisiana		73,650	71,650	70,350
Coastal Louisiana		178,350	174,400	145,600
TOTAL LOUISIANA	244,800	252,000	246,050	215,950
Arkansas	27,400	27,000	27,450	30,100
Eastern	115,000	120,500	116,000	107,900
Michigan	30,600	46,850	40,100	33,650
Wyoming	44,000	51,600	49,000	35,900
Montana	14,600	16,850	14,800	10,350
Colorado	4,800	4,650	4,200	4,050
New Mexico	91,400	105,950	102,950	63,750
TOTAL EAST OF CALIF.	2,663,100	2,877,250	2,835,750	2,354,750
California	579,900	620,200	586,600	563,700
TOTAL U. S.	3,243,000	3,497,450	3,422,350	2,918,450

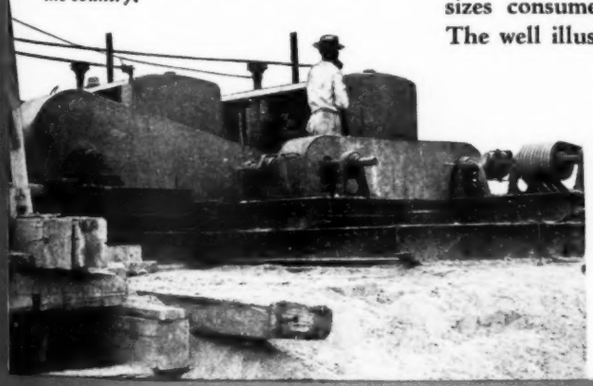
ast . . . steady
. . low-cost . . .
rilling with

CATERPILLAR DIESEL ENGINES

REG. U.S. PAT. OFF.



Enclosed V-belt engine-to-engine drive and drive to draw-works—plus V-belt to mud pump. Multi-speed draw-works—unitized (rebuilt from steam rig) with reverse clutch. One of the first V-belt rigs in this part of the country.



OPERATING in the Sam Fordyce (Texas) field, Henshaw Brothers, Inc., made a fast record . . . reaching the sand, 2767 feet, in 47 hours of drilling under the surface crust. Not only was no time lost, but the power cost was one of the lowest ever established on this depth and terrain. How come? "Caterpillar" Diesel Engines were used. Two 125-hp. sizes consumed only about 1200 gallons of Diesel fuel per 2700 feet. The well illustrated is the 24th which has been drilled by these same two engines. Average depth, 3000 feet. Up-keep costs have been low (one engine "went 23 wells" without a single repair need).

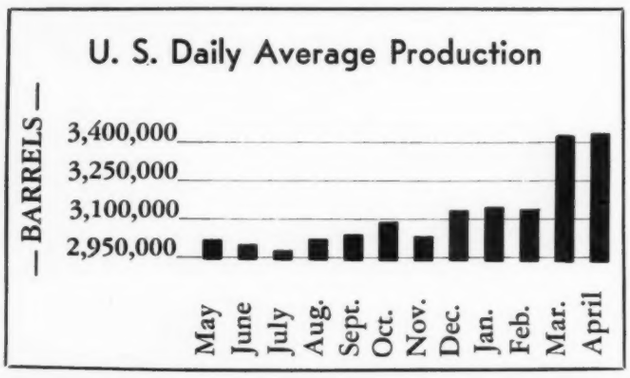
Operating on cheap fuel — with low maintenance and slow depreciation — "Caterpillar" Diesel Engines are revolutionizing power methods — cutting operating costs to a degree unparalleled by any other drilling improvement in years. Complete information is obtainable from a nearby dealer — or through inquiry sent direct to us.

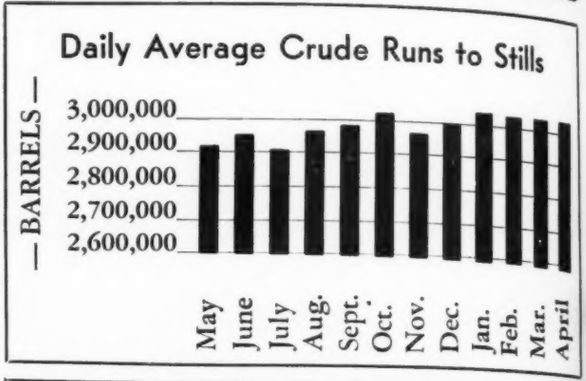
SEVEN ENGINE SIZES—FROM 44 TO 160 HP.

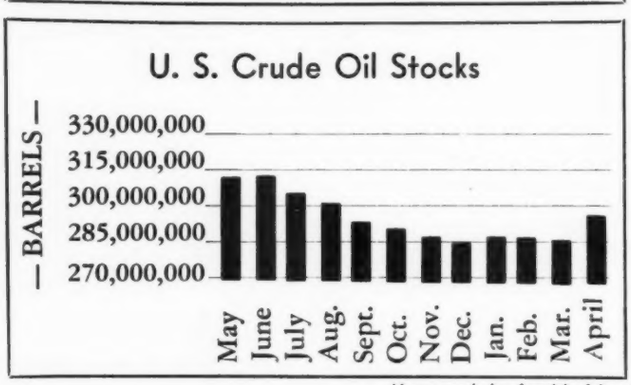
CATERPILLAR TRACTOR CO., PEORIA, ILL.

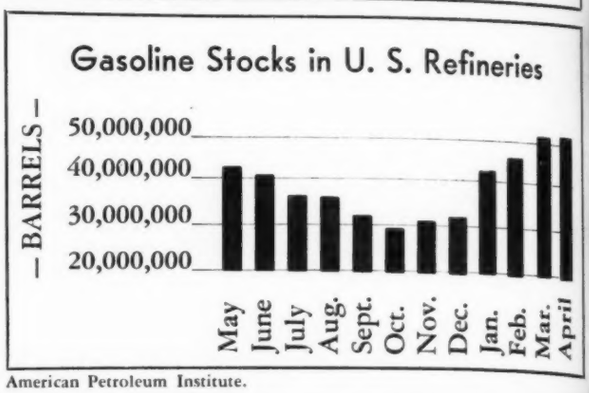
WORLD'S LARGEST MANUFACTURER OF DIESEL ENGINES

Summary of Petroleum Statistics and Field Activities









Above statistics furnished by the American Petroleum Institute.

Summarized Operations in Active Fields for April, 1937

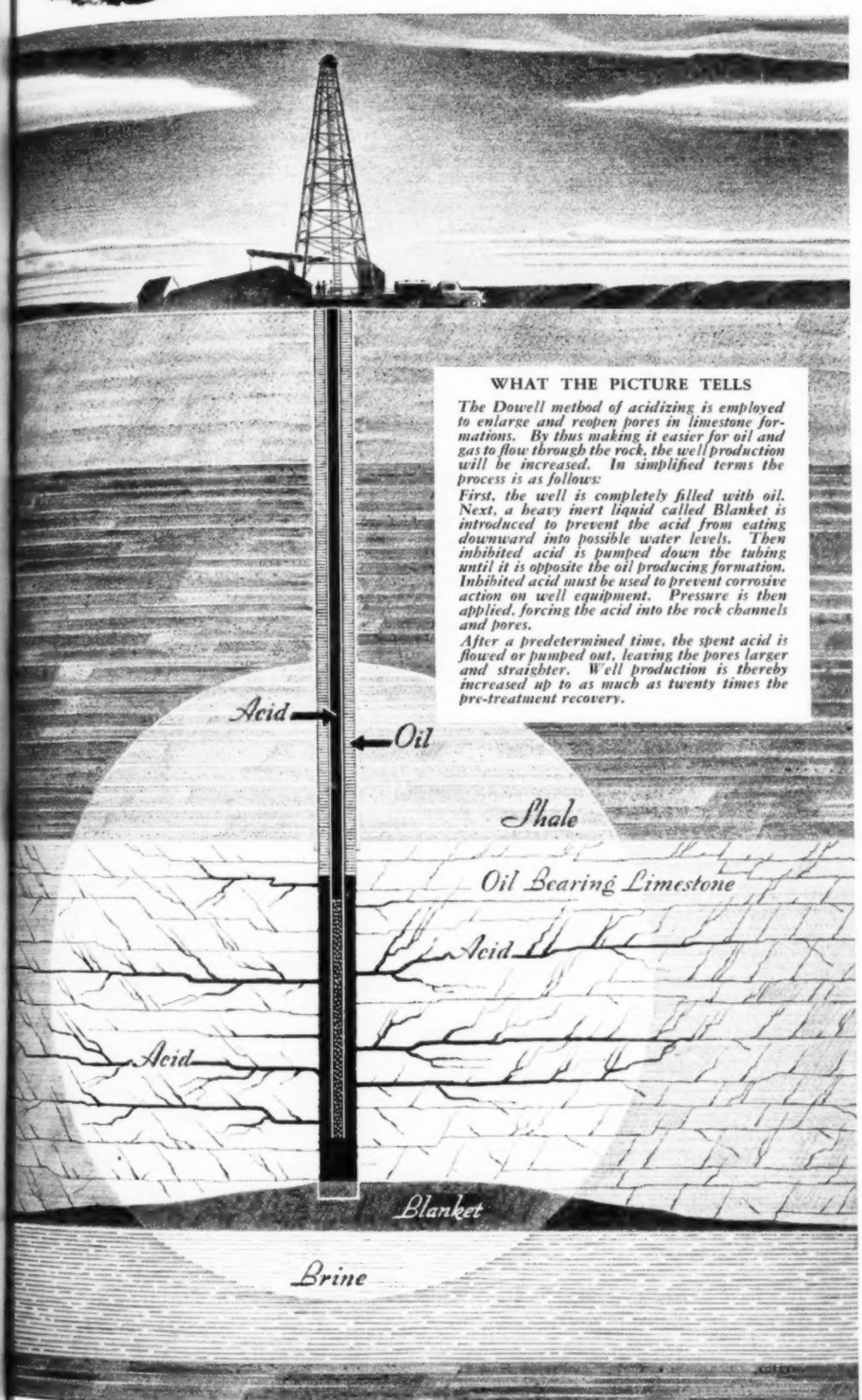
Fields	Completions	Producers	Rigs	Drilling Wells	Depth of Production	No. Casing Strings	Gravity of Oil	Type of Tool Used
Texas								
East Texas	219	214	46	111	3500-3700	2	40	Rotary
Duval County	93	64	19	55	1554-2900	2	22	Rotary
Archer County	50	19	4	19	660-1800	1 or 2	40	Rot.-Cab.
Panhandle	68	63	59	129	1700-3900	2	40	Rotary
Refugio	21	18	3	13	4900-5900	2	38	Rotary
Nueces County	49	42	23	57	3922-5878	2 or 3	21-54	Rotary
San Patricio County	18	12	3	10	3987-6141	2	23-65	Rotary
Talco Field	46	46	9	38	4230-4361	2	16-24	Rotary
Oklahoma								
Oklahoma City	20	18	3	14	6450-6682	3	39	Rotary
Fitts Pool	63	52	8	53	1800-4488	2 or 3	38	Rotary
Osage County	23	17	6	29	380-2850	2	37.5-40	Rot.-Cab.
Kansas								
McPherson County	8	7	2	10	2900-4300	2	38	Rot.-Cab.
Russell County	45	41	9	53	2926-3435	2 and 5	32-37	Rot.-Cab.
Rice County	64	55	10	54	3222-4085	2 and 5	42-48	Rot.-Cab.
Reno County	25	20	8	31	3300-4375	2 and 5	42-48	Rot.-Cab.
Louisiana-Texas								
Rodessa	40	40	4	58	5950-6450	3	39	Rotary
New Mexico								
Lea County	62	62	20	112	3150-4030	3	30-34	Rot.-Cab.
California								
Kettleman Hills	3	3	2	10	8300-8730	3 or 4	40	Rotary
Wilmington	26	26	35	35	3500-4000	2 and 3	18-20	Rotary
Midway-Sunset	22	22	17	24	1400-3100	1 and 2	11-30	Rot.-Cab.

Field Activities by States for April, 1937

State	Completions		Producers		Locations		Rigs		Drilling Wells		Production, 1936 (In Barrels)
	April	March	April	March	April	March	April	March	April	March	
Arkansas	13	8	4	2	24	26	12	16	48	47	10,461,000
California	141	90	123	79	177	122	135	110	276	271	214,883,000
Colorado	1	3	0	1	....	....	1	3	28	25	1,670,000
Illinois	9	6	5	6	....	....	39**	39*	18	8	4,452,000
Indiana	11	7	5	5	....	....	7	6	39	29	795,000
Kansas	255	182	200	146	315	191	78	75	392	367	58,226,000
Kentucky	10	11	6	9	....	....	30	13	70	46	5,653,000
Louisiana	71	71	53	44	121	82	43	32	224	195	79,980,000
Michigan	65	57	48	37	103	77	108	78	146	144	11,852,000
Mississippi	1	....	0	....	....	....	5	2	10	8	Gas Prod.
Montana	15	3	14	3	....	....	8	3	50	45	5,632,000
New Mexico	62	69	62	69	....	....	17	15	124	111	27,134,000
New York	....	....	....	....	....	....	7	9	51	49	4,637,000
Ohio	107	155	72	108	....	....	91	73	265	260	3,834,000
Oklahoma	317	232	237	174	351	243	72	63	501	494	206,082,000
Pennsylvania	....	....	....	....	....	....	40	....	163	....	15,830,000
Texas	1503	1176	1177	929	1709	1746	461	453	1527	1521	391,097,000
West Virginia	78	77	63	67	....	....	24	28	151	168	3,903,000
Wyoming	11	12	7	5	....	....	4	2	51	48	13,650,000
Total	2670	2157	2076	1684	2800	2487	1182	1020	4134	3836	993,942,000

*Includes seven operations rigging up, 27 temporarily shut down, and five inactive.
**Includes nine operations rigging up, 25 temporarily shut down, and five inactive.

VITALIZING OIL WELLS VIA *Chemistry*



WHAT THE PICTURE TELLS

The Dowell method of acidizing is employed to enlarge and reopen pores in limestone formations. By thus making it easier for oil and gas to flow through the rock, the well production will be increased. In simplified terms the process is as follows:

First, the well is completely filled with oil. Next, a heavy inert liquid called Blanket is introduced to prevent the acid from eating downward into possible water levels. Then inhibited acid is pumped down the tubing until it is opposite the oil producing formation. Inhibited acid must be used to prevent corrosive action on well equipment. Pressure is then applied, forcing the acid into the rock channels and pores.

After a predetermined time, the spent acid is flowed or pumped out, leaving the pores larger and straighter. Well production is thereby increased up to as much as twenty times the pre-treatment recovery.

SO VITAL is petroleum in our highly mechanistic age, that it might be said a nation's Sword of Damocles is no longer suspended by a thread but by a drop of oil.

Since the days of Colonel Drake who gave America its first commercial oil well in 1859, the discovery and production of petroleum has constituted one of the most vivid chapters in our national development.

Billions of barrels have flowed from the earth's depths in close to one-half of our states—and there is little question that this abundant resource has literally oiled the wheels of American progress.

But, despite our apparently bountiful supply, both known and yet to be discovered, the need for more efficient and conservative production of petroleum has been long regarded as essential.

A sizable stride in this direction was taken when, five years ago, Dow brought to the oil-producing industry through its subsidiary, Dowell Incorporated, a specialized chemical service for oil wells.

Whereas formerly, through natural and mechanical means, oil producers extracted approximately twenty per cent of the potential petroleum accumulation, by putting chemistry to work they stepped recovery up to double and even triple this amount.

Stripped of technicalities, Dowell undertakes through special acids and chemicals to overcome natural barriers to greater oil production in areas where oil is produced from limestone or dolomitic formations.

To render this service, Dowell maintains headquarters at Tulsa, Oklahoma, and a complete field organization located in the principal oil fields.

To date, it has treated over 9,000 wells, resulting in approximately $50,000,000 gain to the oil industry. In servicing these wells, Dowell trucks and cars have traveled 4,500,000 miles and its treating engineers have handled millions of gallons of special chemicals.

* **DOWELL**

OIL AND GAS WELL CHEMICAL SERVICE

*Trade Mark Registered U. S. Patent Office

DOWELL INCORPORATED · *Subsidiary of the* DOW CHEMICAL COMPANY · *Executive Office:* MIDLAND, MICHIGAN · *General Office:* KENNEDY BUILDING, TULSA, OKLAHOMA
IN MEXICO . . . DOWELL SOCIEDAD ANONIMA, Apartado 2424, Mexico, D. F., Mexico · Tampico, Tamaulipas, Mexico

PHONE, WRITE OR CALL AT ANY OF THE FOLLOWING OFFICES:

ADA, OKLAHOMA · CODY, WYOMING · EUREKA, KANSAS · GREAT BEND, KANSAS · HOBBS, NEW MEXICO · LAWRENCEVILLE, ILLINOIS · LONG BEACH, CALIFORNIA
MIDLAND, TEXAS · MT. PLEASANT, MICHIGAN · NEWTON, KANSAS · SEGUIN, TEXAS · SEMINOLE, OKLAHOMA · SHELBY, MONTANA · SHREVEPORT, LOUISIANA
TULSA, OKLAHOMA · WICHITA, KANSAS · WICHITA FALLS, TEXAS

The Month's Activities In Refining

Percent Refinery Capacity Operated

Western Division, 65.1 Percent **Central Division, 79.2 Percent** **Eastern Division, 86.0 Percent**

HOFFMAN, Peters and Lillard have started the construction of a 1000-bbl. skimming plant near Bryson, Texas, to operate on crude from the East Bryson field, Jack County.

●

The Pentagon Refinery Company, Detroit, Michigan, will erect a 1200-bbl. cracking plant at Muskegon, it has been announced.

●

Robert E. Guy plans a 1000-bbl. skimming plant at Rosebush, Michigan, north of Mount Pleasant. Crude from the new Buckeye Township field of Gladwin County will supply the plant.

●

The Crystal Refining Company, Carson City, Michigan, contemplates the removal of its 2000-bbl. skimming plant to Bay City. Del Fortney is head of the company.

●

Enlargement of its gasoline plant in the Cotton Valley field, Webster Parish, Louisiana, has been announced by the United Gas Public Service Company. When originally constructed a number of years ago the plant was designed for handling production from shallow wells. With the recent discovery of deep gas and distillate production, however, it was decided to remodel the plant to care for the high-pressure gas obtained from the deeper level. When present plans are completed the plant will have both high-pressure and low-pressure units. The plant will be of the absorption type with a capacity of 25,000,000 cu. ft. of gas daily.

●

The Skelly Oil Company has started construction of a 2,000,000-cu. ft. gasoline plant in Hutchinson County, Texas. The plant, of the absorption type, is expected to be completed by June 1, manufacturing initially 10,000 gal. of gasoline daily. It is connected to approximately 130 wells in the area.

Seven 80-hp. engines will be installed, and the plant will be so designed that it can be enlarged later.

Crude Runs to Stills, Gasoline, and Gas and Fuel Oil Stocks

Week Ended May 1, 1937

A.P.I. Figures

(Figures in Barrels of 42 Gal. Each)

DISTRICT	Percent Potential Capacity Reporting	Daily Avg. Crude Runs to Stills	Percent Operated of Total Capacity Reporting	Total Motor Fuel Stocks Thousands of Bbl.	Gas and Fuel Oil Stocks Thousands of Bbl.
East Coast	100.0	550,000	82.2	18,747	5,817
Appalachian	88.4	105,000	81.4	2,782	543
Ind. Ill., Ky.	92.1	441,000	94.4	14,463	4,534
Okla., Kans., Mo.	84.6	307,000	80.8	9,448	2,911
Inland Texas	54.3	115,000	62.8	2,099	1,289
Texas Gulf	95.5	659,000	87.1	11,233	6,258
La. Gulf	96.3	141,000	89.2	1,466	1,645
No. La.-Ark.	63.7	44,000	75.9	430	299
Rocky Mt.	69.7	38,000	61.3	1,891	700
California	90.9	514,000	68.9	14,296	68,038
Reported	88.8	2,914,000	80.7	76,855	92,034
Est'd Unreported	.....	226,000	.....	5,418	2,496
*EST'D TOTAL U. S. May 1, '37	.....	3,140,000	.....	82,273	94,530
*EST'D TOTAL U. S. Apr. 24, '37	.....	3,125,000	.....	82,303	94,100
U. S. B. of M. *May,1, '36	.....	**2,818,000	.....	73,448	97,893

*Estimated Bureau of Mines basis.

**April, 1936, daily average.

Standard Oil Company of Louisiana has announced it will install a polymerization unit in its refinery at Baton Rouge, Louisiana, involving an expenditure of $650,000. The company recently announced plans for a $2,750,000 lubricating oil plant, to be installed in the same refinery.

●

Southern Minerals Corporation, Corpus Christi, Texas, is to install additional equipment in its gasoline plant recently completed in the Saxet area. The Western Supply Company has been given the contract. The existing absorber group will be duplicated, additional storage will be provided, a 225-ton refrigerating system and a propane-butane recovery unit installed. The new equipment will increase the plant's capacity from 20,000,000 cu. ft. daily to 35,000,000 cu. feet.

●

The Phoenix Refining Company is completing a new 1500-bbl. refinery at Rio Grande City, Texas. Later the capacity will be increased. The plant will operate on crude from the Rio Grande City and El Tanque pools.

●

The Talco Asphalt and Refining Company plant being constructed in the Talco field, Texas, by Lucey-Fair-Byrd-Frost interest of Dallas will be completed by not later than June 15, possibly sooner, officials have announced. Capacity of the plant will be 5200 bbl. daily, manufacturing gasoline, road oil, and other by-products.

●

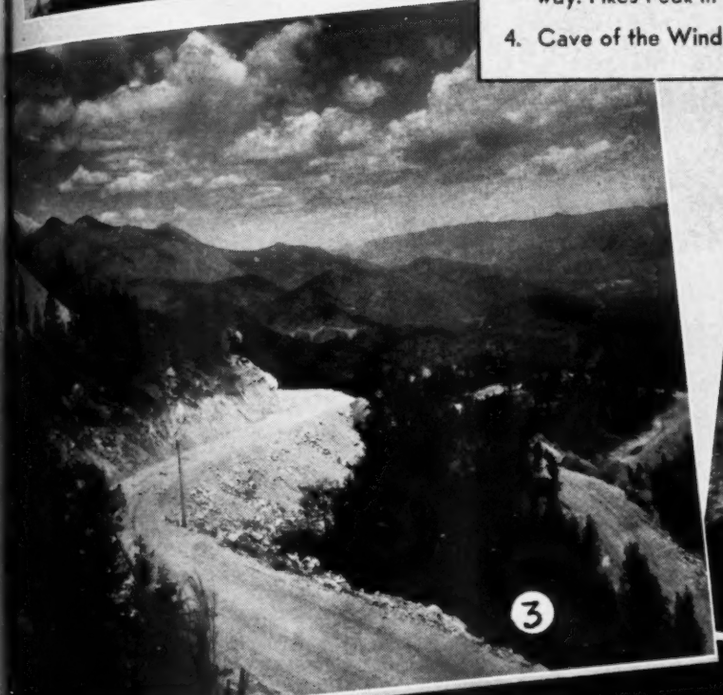
General Petroleum Corporation of California is constructing a natural gasoline plant in the new Wilmington field, California. Capacity of the plant will be 15,000,000 cu. ft. of gas daily. Completion is expected by June 15.

Pictorial PETROLEUM

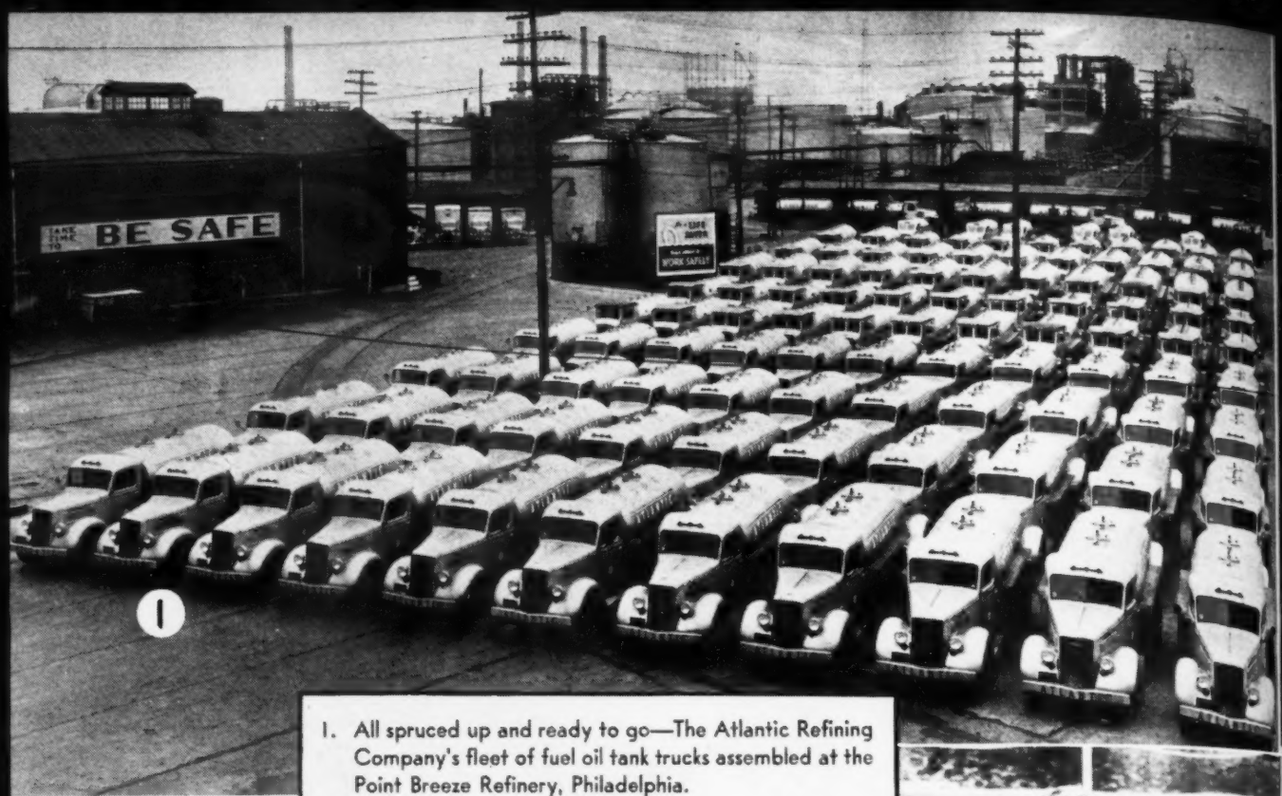
MAY - 1937

SCENES at COLORADO SPRINGS, COLO., WHERE 1937 MID-YEAR MEETING OF THE AMERICAN PETROLEUM INSTITUTE IS TO BE HELD

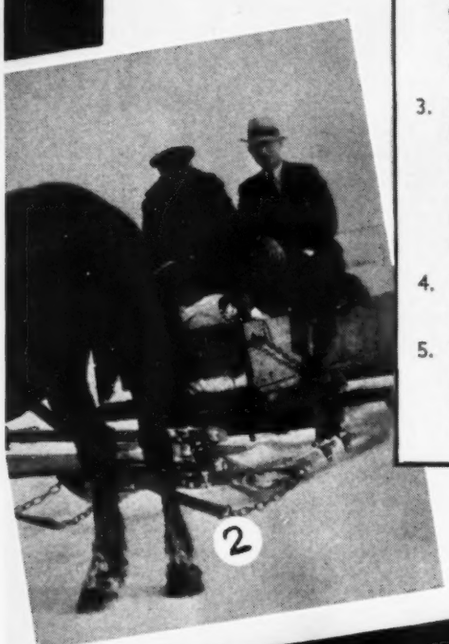
1. Will Rogers Shrine of the Sun on Cheyenne Mountain.
2. Broadmoor Hotel, meeting headquarters.
3. Broadmoor-Cheyenne Highway. Pikes Peak in upper left.
4. Cave of the Winds.

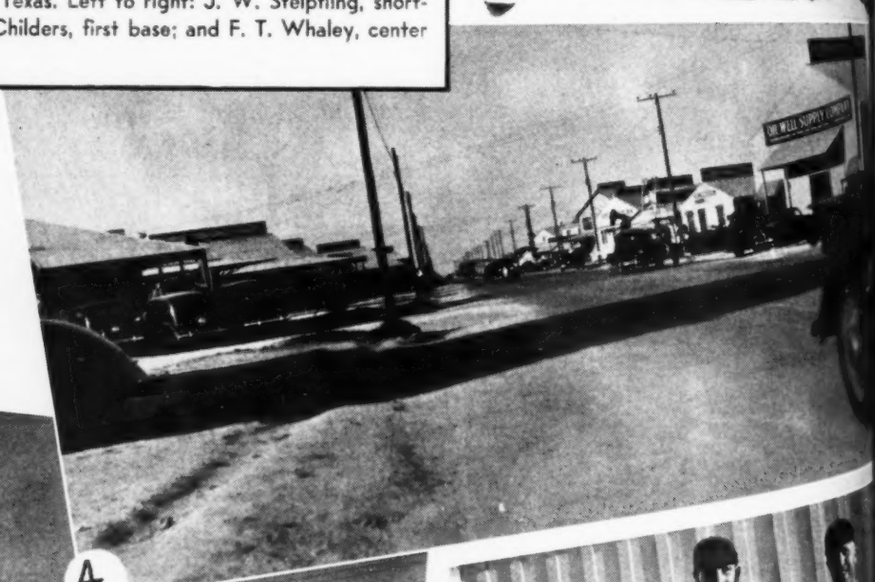


A REGULAR FEATURE OF THE PETROLEUM ENGINEER

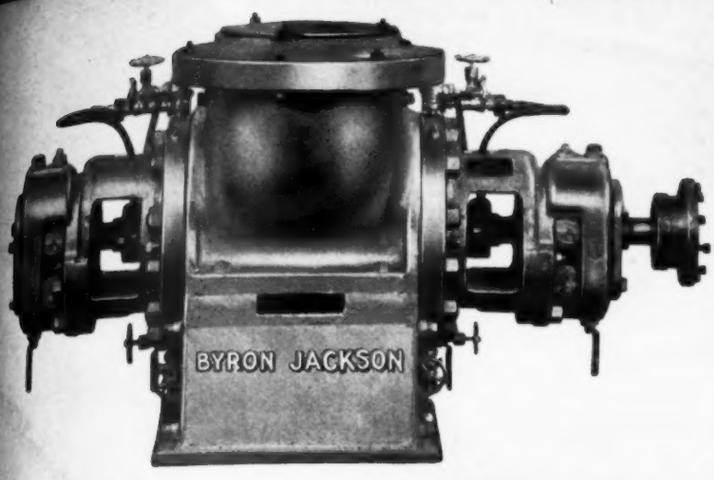


1. All spruced up and ready to go—The Atlantic Refining Company's fleet of fuel oil tank trucks assembled at the Point Breeze Refinery, Philadelphia.
2. L. D. Hilton, sales manager for Cameron Iron Works Company, snapped on a recent trip to the frozen fields of Canada. L. L. Rector of Rector Well Equipment Company accompanied Mr. Hilton on the trip.
3. Bill Lane, vice-president of The Lane-Wells Co., and Bill Thorn offer proof of their fishing skill with this picture of twenty beauties taken from Lake Arrowhead on the opening day, May 1st. This catch, photographed at nine o'clock in the morning, was one of the first "limits" recorded for the day.
4. Two views of supply row in the busy Corpus Christi field.
5. Three members of the Sun Oil Company baseball team at Freer, Texas. Left to right: J. W. Stelpfling, shortstop; T. Childers, first base; and F. T. Whaley, center field.





PUMPS FOR EVERY OIL INDUSTRY SERVICE

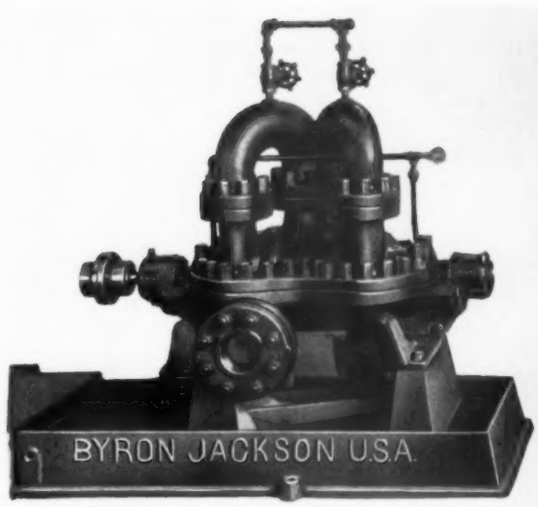


SINGLE STAGE DOUBLE SUCTION HOT OIL PUMP

This type pump is particularly designed for reflux and similar services requiring capacities above that for which single suction type impellers are suited, and at heads in the "Medium-High" bracket. This pump, with its two outboard bearings, stuffing boxes at suction pressure, hydraulically balanced double suction impeller, and rugged construction, meets heavy duty oil pumping requirements not possible with any other equipment. Byron Jackson Single Stage Double Suction Hot Oil Pumps handle from 800 to 3,000 gallons of oil per minute, at temperatures up to 800 degrees F., against heads from 100 to 325 pounds per square inch.

BYRON JACKSON MULTIPLEX PUMPS BOILER FEED AND BOOSTER SERVICE

The installation (above right) is a Byron Jackson 4-stage Multiplex handling mineral seal oil in a gasoline plant. These pumps are of the split-case, multi-stage, volute type, and offer the maximum efficiencies available today, plus the ability to operate without down time, at extremely low cost for both operation and maintenance.

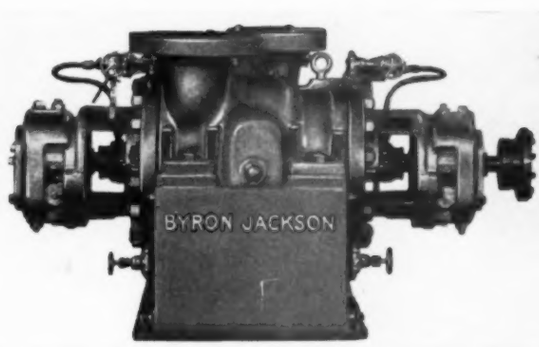


COLD OIL CHARGING SERVICE and PIPE LINE SERVICE

This type of "Heavy Duty" pump is ideal for charging pipe stills where the oil handled is below 300 degrees F., and it is also well suited for pipe line service. Capacities range up to 100,000 barrels per day, against pressures as high as 700 pounds per square inch.

VC 2-STAGE HOT OIL PUMPS

These pumps are furnished in different types to handle from 20 to 4,000 gallons per minute, of oil at temperatures from 300 to 850 degrees F., on differential pressures up to 350 pounds per square inch. Many modern features of efficiency and safety are responsibile for the increasing use of this type of pump by the Petroleum Industry.



Established 1872

BYRON JACKSON CO.

and Subsidiary

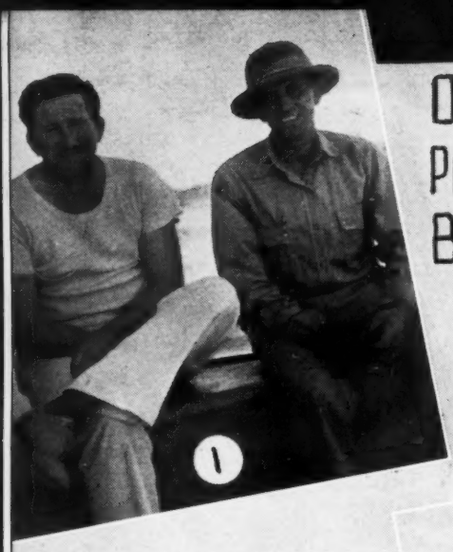
Factories at: Berkeley • LOS ANGELES • Bethlehem

Branches: New York, Tulsa, Salt Lake City

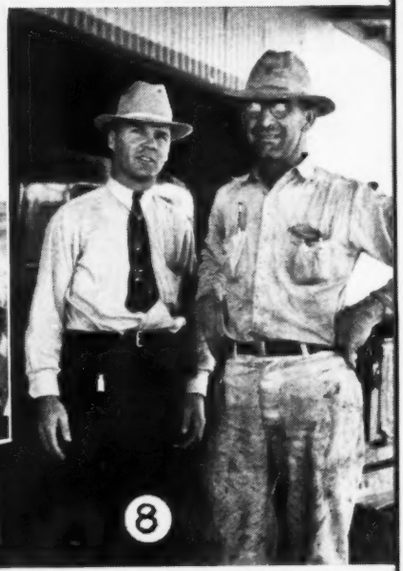
BYRON JACKSON

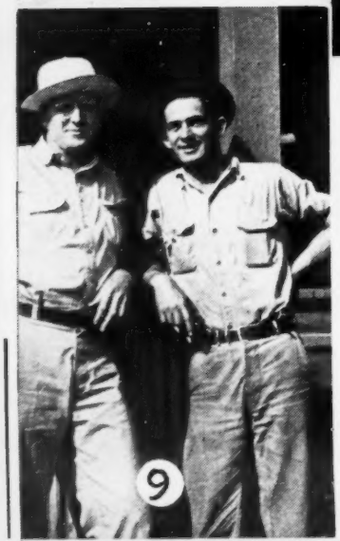
CENTRIFUGAL PUMPS FOR EVERY SERVICE

OPERATING MEN PROMINENT IN THE BRISK DRILLING ACTIVITY IN SOUTH TEXAS

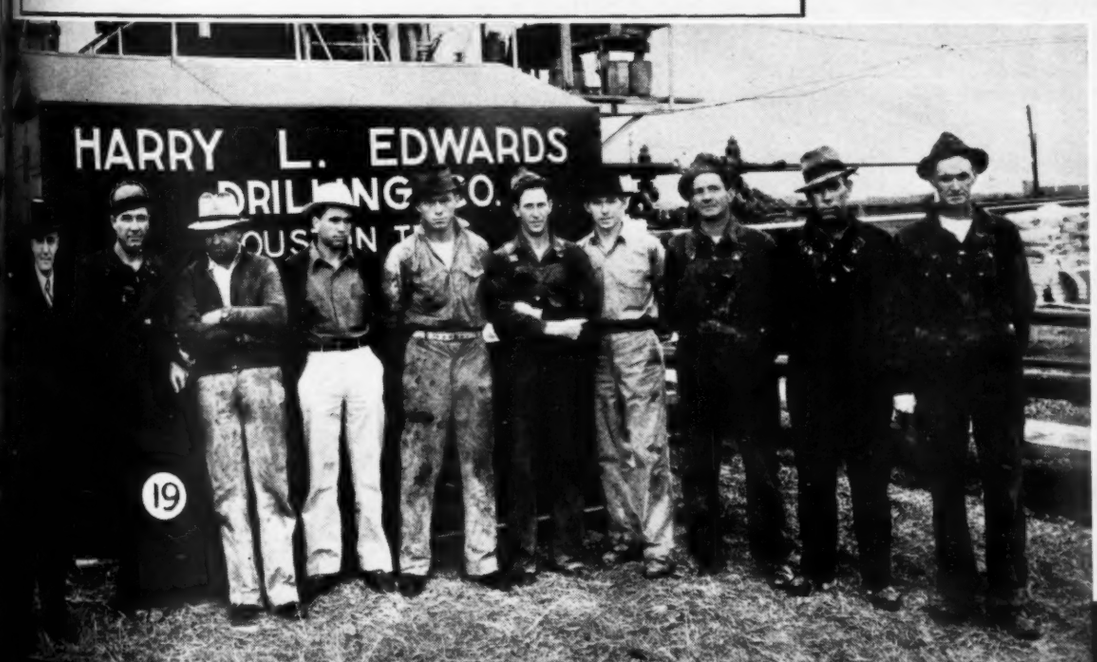


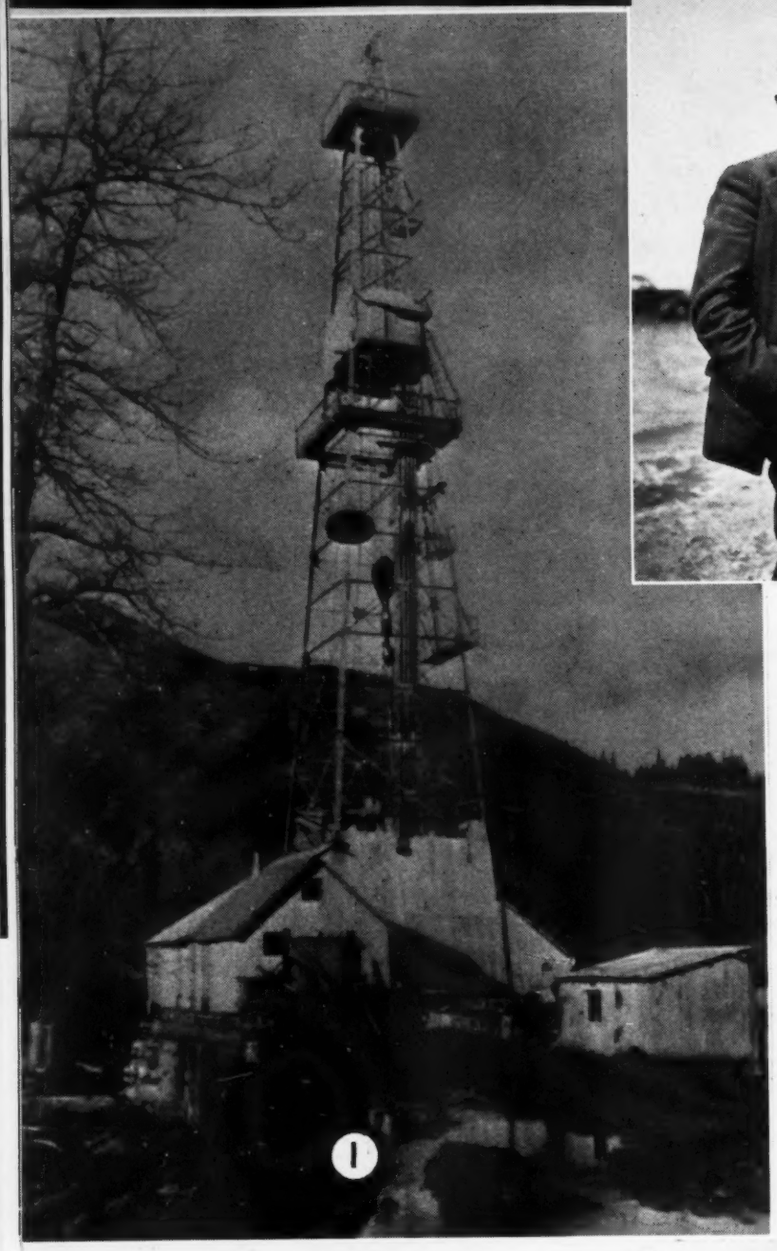
1. E. B. Massie (left), dispatcher, United Gas System, Escobas, Texas; and S. H. Satter, field foreman, Bruni section.
2. J. E. Doffing (left), independent operator, and J. F. Powell, independent operator, both of Mission, Texas.
3. C. T. Tucker, drilling superintendent, Milam Drilling Company, Hebbronville.
4. Earl Oliver (left), superintendent for J. J. O'Hern, Bruni, Texas; and J. R. Barrett, representative for Atlas Engineering Company, Corpus Christi.
5. E. D. Taylor, with Hammil & Smith, independent operators, Bruni, Texas.
6. H. W. McDowell (left), superintendent for Mills Bennett Production Company at Pettus, and O. J. Work, representative for Fred E. Cooper Company at Beeville, Texas.
7. Left to right: Jim Galloway, district petroleum enginner; Frank Owens, petroleum engineer; and Otto Rayburn, all with Humble Oil & Refining Company, Taft, Texas.
8. J. K. Carter (left), representative for Bradford Motor Works at Houston, Texas, and W. A. Brandhorst, superintendent for the Mills Bennett Production Company, Lopez Field.
9. A. Young (left), superintendent for Highland Oil Company, Bruni, Texas; and George Groesbeck, lease foreman, The Texas Company, Bruni.
10. W. M. Crumpler (left), drilling superintendent, Cron & Gracey, Houston; and D. C. Hands, Houston representative for Greenhead Bit & Supply Company.
11. Paul A. Henshaw, drilling contractor, McAllen, Texas.
12. C. W. Barrett (left), store manager for Houston Oil Field Materials Company at Hebbronville, Texas, and H. L. Bedwell, drilling contractor, Alice, Texas.





13. Front row (left to right): C. G. Swank, farm boss, Humble Oil & Refining Company, Conroe; Red Griffith, W-K-M Company; W. S. Bradley, superintendent, Humble Oil & Refining Company; back row: J. S. McCune, district petroleum engineer, and E. C. (Buddy) Hall, chief clerk, both with the Humble at Conroe.
14. Mr. and Mrs. J. A. Pearl and daughter, Hebbronville, Texas. Mr. Pearl was for fourteen years with Simms Oil Company, and now an independent operator.
15. Left to right: Sam Krasner, independent operator, Laredo, Texas; H. R. Dyke, storeman for Frick-Reid Supply Corporation, Bruni; and Glenn Harroun, independent operator, Laredo, Texas.
16. Left to right: C. M. Halsted, petroleum engineer for Stanolind Oil & Gas Co., South Houston; J. T. Patton, driller for Cron & Gracey; Wayne Johnson, representative for Williamsport Wire Rope Company, Houston; Red Fuller, representative, Mid-Co Supply Company, Houston; E. H. Lamb, rotary helper; J. M. Craver; A. A. Huffster; and L. Hirsch, the four latter with Cron & Gracey.
17. Robert Horton, representative, and Fred Wallace, manager of the Houston district for Link-Belt Company.
18. Left to right: C. F. Hargis, construction foreman; J. B. Bollinger, drilling tool foreman; and C. O. Hill, production superintendent, all with the Magnolia Petroleum Company at Mirando City, Texas.
19. A few of the members of the large Harry L. Edwards Drilling Company organization. Left to right: H. L. Edwards, president; J. F. Burdett, tool pusher; Don Roberts, tool pusher; Ben Bell, helper; Snooks Westmire; Ed Laughlin, driller; Milton McPherson, mud engineer; J. W. Johnston; Bud Laughlin, driller; and George Ruche, all of Houston.
20. Doug Garwin (left), storeman for Houston Oil Field Materials Company, and C. W. Sinton, drilling superintendent for Henshaw Bros., Mission.





1. With the end of winter, preparations are under way to resume drilling on the exploratory well which the Iniskin Drilling Company of Los Angeles are putting down six miles inland from Chinitna Bay on Cook's Inlet in Alaska. As this is the first test well to be drilled in Alaska, results are being watched with considerable interest. Initial work on the well was started last summer, with the shipment of the 122-ft. galvanized Bobtail derrick from the California plant of the International Derrick & Equipment Company in June, 1936. Drilling had progressed to a depth close to 3000 feet when winter weather halted operations.
2. Wm. G. Cummings, sales manager, Royal Manufacturing Company, Tulsa, Oklahoma.
3. J. M. O'Melveny, manager of the Mid-Continent district for Patterson-Ballagh Corporation, and H. B. Book, representative for the Reed Roller Bit Company.
4. String of tank cars in the Talco, Texas, area.
5. R. P. Bradford, superintendent for Adams & Lyle, independent producers at Talco, Texas.

THE Petroleum Engineer

MAY, 1937

Progress Made in Extinguishing Burning Texas Well

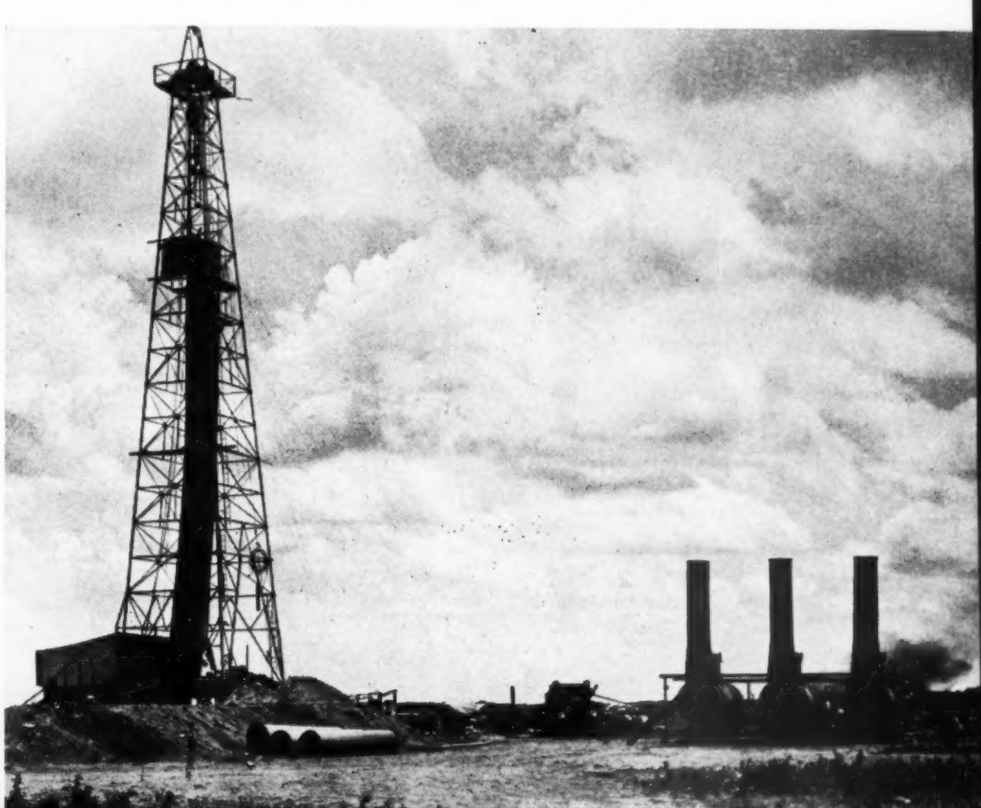
By

PAUL R. CLEGG

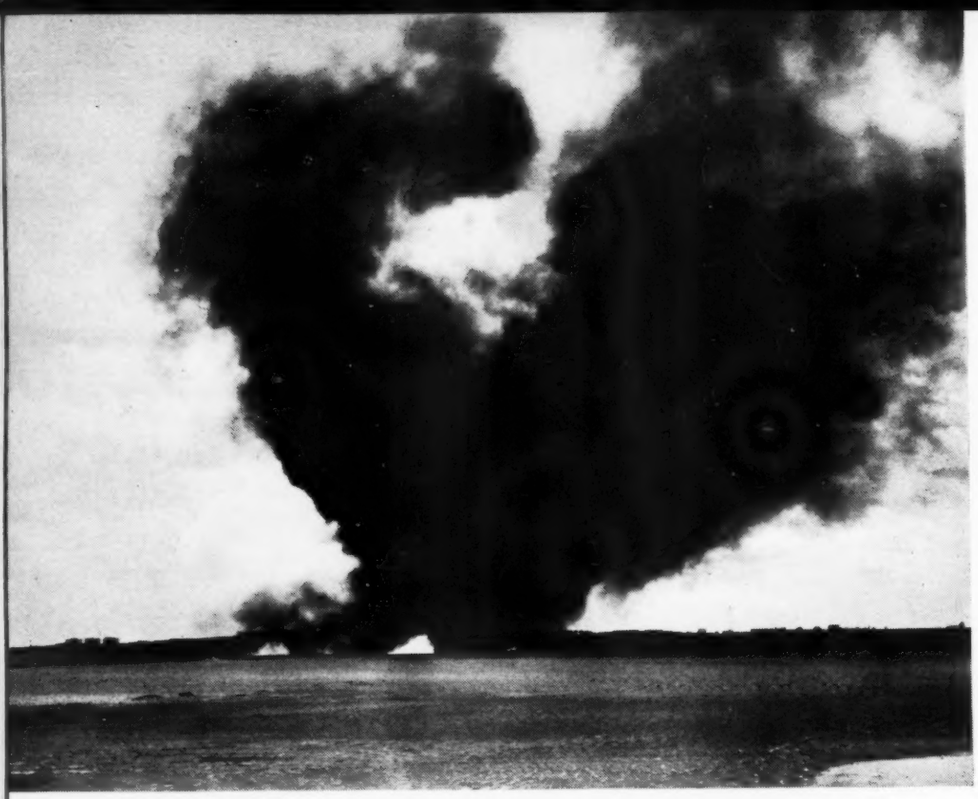
For almost six months Texon Drilling Company's No. 2-B Driscoll has been on fire in the Agua Dulce field, and control methods at last are beginning to show results

FOR almost six months now science and drilling crews have joined forces in one of the most interesting fights in the history of Texas oil fields. On November 19, 1936, the Texon Drilling Company's No. 2-B Driscoll, Agua Dulce field near Corpus Christi, blew out and caught fire. Since that time every known method has been employed to tame the cratered well and extinguish the flames. The well still belches mud and water and continues to burn.

For the past month 10,000 bbl. of water and mud have been forced to the bottom of the hole daily through a relief well drilled to hit within a narrow radius of the wild well. A pressure of 2000 lb. has been maintained. The



General layout of relief well and boiler setup at Texon's No. 3 Sullivan near Driscoll, where efforts are being made to quench the fire that has been raging since November 26, 1936. Note the truck standing by in readiness to cement the hole immediately the flow is shut off



An additional picture of the fire at Texon's No. 3 Sullivan, showing a small blaze and considerable smoke, indicating the progress being made in bringing the well under control

well, however, still burns and the main crater continues to boil, flooding a considerable area with mud, water, and some distillate. Considerably less flame and much less pressure is in evidence than a month ago. Continued efforts along the present line seem certain eventually to shut off the flow and permit cementing off.

A history of the well and its behavior has been kept by the Eastman Oil Well Survey Company. James B. Hughes of that company planned the relief well and stayed on the job until the well was within 400 ft. of its objective.

No. 2-B Driscoll blew out while taking a core at 6357 feet. According to the crew, without warning the well "kicked" rather vigorously and soon was out of control. It cratered as a result of gas escaping around the surface pipe and coming up under the rig. Some twelve hours after it blew out the well had formed a crater that completely engulfed the rig and boilers.

The production of the well, at the time of the blowout, was conservatively estimated at 5000 bbl. of high-gravity crude and upwards of 100,000,000 cu. ft. of gas daily.

The volume of mud and water ejected by the well was so great that a dike five ft. high and enclosing an area 1000 ft. square, was "thrown up" to prevent flooding the surrounding area. Within three days the dike was almost filled with mud and water. By this time so widespread was the cratering that it was useless to attempt further methods of control on the well and efforts were directed toward keeping the mud and water from flooding surrounding farm lands.

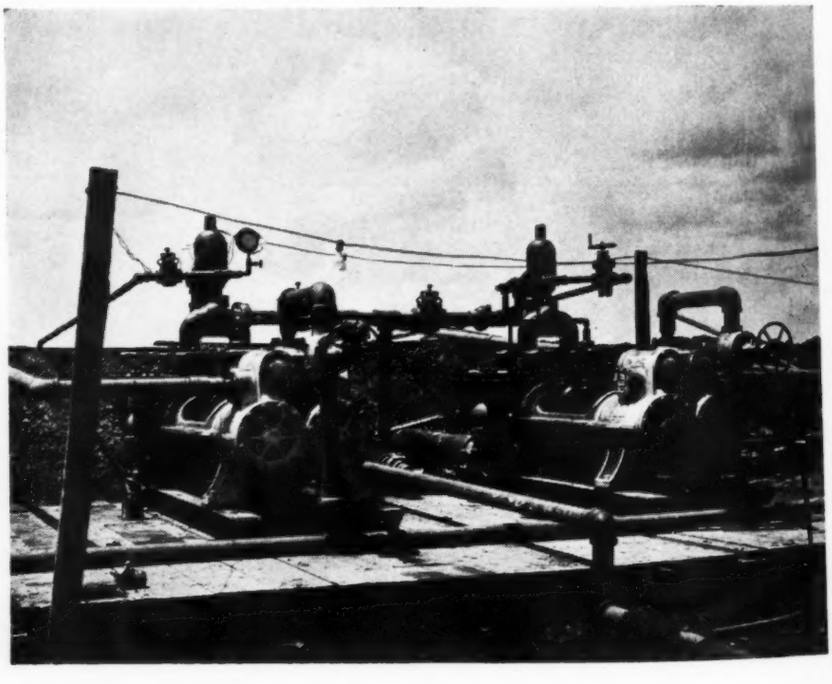
The well ignited almost immediately after it blew out and burned viciously. About ten days after the blow-out, the hole seemed for some reason to plug-up and extinguished the fire for a few minutes; then the well re-ignited. It has burned continuously since.

Once the water and mud were under control, a relief well was planned with the idea of drilling so that it would be deflected to within a narrow radius—30 ft. or so—from the bottom of the wild well. Meanwhile, an old artesian well, which had been dormant for more than 25 years, burst into a small crater making a head of water and mud every minute or so. Other small craters appeared in the sea of mud and water.

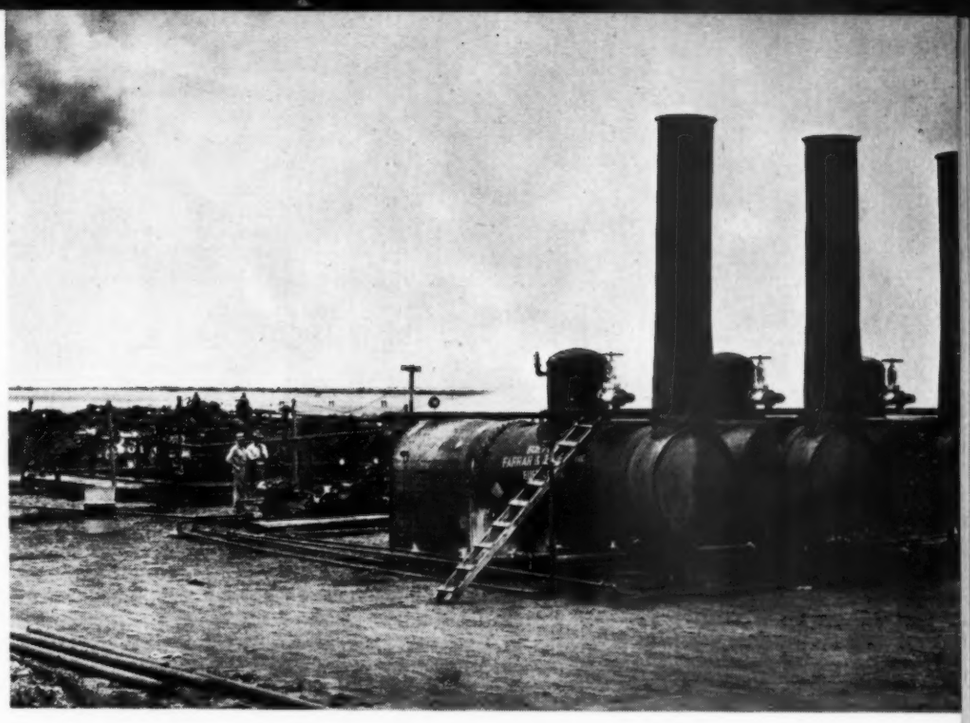
The relief well was drilled to a depth of 1459 ft. and 10-in. casing set and cemented. The hole was then drilled to 1650 ft. where the declination began. Direction and angle was maintained by weight and speed control.

On February 10, while attempting to ream the hole to the bottom with a pilot bit, the pipe "froze" and could not be raised or lowered. No additional circulating pressure was evident; but the pipe was fast and could not be moved.

Drilling was resumed on March 10, about 30 days later, after washing over and pulling the drill pipe. The hole was still giving considerable trouble, however, and it was found necessary to insert a reamer in the string about



Two 6 by 18 slush pumps used in pumping mud and water into the bottom of the Texon No. 3 Sullivan, which has been burning since November 26, 1936. The hole is 6250 ft. deep. A relief well has been slant-drilled and is being used to pump mud and water into the bottom of the hole under a pressure of 2000 lb. in an effort to shut off the flow. The pumps had been in continuous operation 24 hours a day for more than ten days when the picture was taken



Three boilers supplying steam to the slush pumps being used on Texon's No. 3 Sullivan in an effort to quench the fire

1800 ft. off bottom and thoroughly ream the upper section in order to drill ahead.

Company engineers decided to drill ahead and let it "bottom-up" at whatever point it would strike the desired depth, and set a protective string. If the well could not be killed from this point, they reasoned, the relief hole could be plugged back to the point of controlled deflection and deflection continued with the protection afforded by the casing. It is estimated that the relief hole hit within a 90-ft. radius of the bottom of the wild well.

A series of pumps have been set up since, providing for a continuous flow of heavy mud and water at a pressure of 2000 lb. and a capacity of 1000 bbl. an hour. The idea behind the move of course is to mud up the area completely at the base of the wild well and shut off the flow of gas.

One of the greatest handicaps in the complete control of the wild well by plugging lies in the various sands that are charged with high-pressure gas at depths from a few hundred feet down to the bottom of the hole. Considerable difficulty has been experienced all over the field in setting surface casing, due to these gas-charged sands. A slight leak around the ground pipe will, in a short time, result in complete destruction of the setup.

The pumps being used in bringing the well under control are 6-in. by 18-in. and are working at almost a 50 percent overload, according to their rated capacity. A Halliburton cement truck, with all connections made or available at a moment's notice, is standing by ready to apply the cement immediately the well is plugged. Three new boilers have been placed in service to overcome the high pumping pressures necessary to saturate the bottom of the hole with mud and water.

The entire oil industry in the Gulf Coast area is watching developments with considerable interest. The Texon No. 2-B Driscoll is not the first or the only wild well of the area. It is, however, the only one now burning. Others are merely making heads of water and mud.

Speculation is rife over just how soon the well, which obviously is costing thousands of dollars in its present condition without the return of a cent, will be placed under control. The methods used will be marked carefully. Science, rather than the old method of hit and miss, will establish a definite method of attack and control, it is believed. The whole area about the well is highly productive, needing only careful, scientific handling to become a valuable field.

A.S.T.M. Issues Specifications for Gasoline

ON the recommendation of Committee D-2 on Petroleum Products and Lubricants, the Standards Committee of the American Society for Testing Materials has approved for publication as tentative, Specifications for Gasoline (D 439—37 T). The specification requirements have been under development in Committee D-2 for some time.

The scope of the specifications states that they are for the use of purchasing agencies in formulating specifications for purchases of gasoline under contract and that they are not a definition of gasoline. They do not include all types of gasoline or motor fuel satisfactory for motor vehicles, as certain equipment or conditions of use may require fuels having special characteristics.

The specifications provide three types of gasoline, as follows: Type A, for use under normal conditions; Type B, for use where a gasoline of greater overall volatility than Type A is desired; and Type C, for use where a relatively non-volatile fuel is desired.

The specifications state the required properties of gasoline at the time and place of delivery in bulk. They provide for an automatic variation by the seller to meet the requirements of seasonal changes in temperature, depending upon the season and the locality in which the product is to be used. This is done by providing three vapor pressures and ten percent distillation points for each type specified and by differentiating the use of these variations according to the months of the year and the geographical location by states.

It is indicated in the requirements that the purchasing agency shall state the minimum octane number as agreed upon with the seller; specify the volatility Type A, B, or C, desired; and indicate the season and locality in which the fuel is to be used. The various requirements given in the new tentative standard, which are to be determined in accordance with test methods issued by the Society, involve distillation, vapor pressure, octane number, corrosion, and gum.

Table I provides a schedule for geographical seasonal variations and represents the time and place and use of the gasoline.

Copies of this new specification are available in separate pamphlet form from A.S.T.M. Headquarters, 260 S. Broad Street, Philadelphia, Pennsylvania, at 25 cents each.

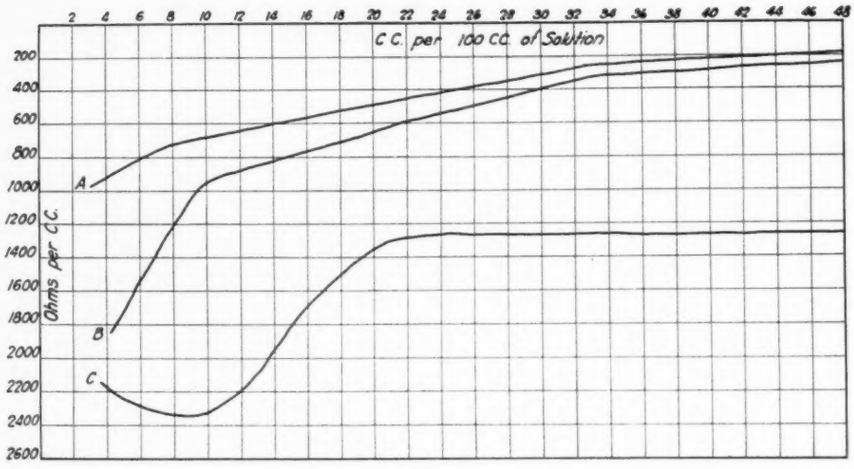


Fig. 1. Illustrating how the ohm cm. resistance of three different corrosive soils varies with saturation

By

DAVE HARRELL

Corrosion Engineer, Houston Pipe Line Company

A Soil Survey Record System for Pipe Line Corrosion Departments

New method of conducting a soil survey in a corrosive area, as evolved by a leading Mid-Continent pipe line company

WHEN oil and gas companies laid pipe lines through sparsely populated areas to terminate at large centers of population only natural elements of corrosion had to be encountered and overcome, but with the increased rural expansion and the settling of these districts more and more man-made forms of corrosion have been creeping in to upset the calculations made from soil surveys and their corresponding future prognostications relating to the prospective corrosive conditions to be expected.

Originally, it was thought feasible to make a soil survey ahead of proposed pipe line construction, and from field measurements of soil resistivity advise the management concerning the probable corrosive severity of the soils encountered and the proper application of high-resistance coating to be applied at various locations along the route. Various field readings were observed for the same location due to the degree of saturation of the soil with either fresh or charged water. There were times when the earth at pipe depth was so dry it was impossible to get any readings at all, and other times when the soil was so diluted with fresh rain water that the readings would not be indicative of true corrosive conditions. In fact, the corrosion department, of which the writer is a part, made such a survey along a certain 4-in. high-pressure gas line and advised the management that due to the high resistance of soils encountered no deleterious effects should be observed over a long period of time; however, it could not be anticipated that an oil well would blow out in the vicinity of this line, thereby causing large quantities of salt water to flow over it. Shortly after this happened, a "hot spot" developed and the company was forced to replace a section of this line. From this experience, our corrosion department evolved a new method of conducting a soil survey in a corrosive area. This method has been in operation for approximately three years, and a great deal of interesting information has been collected.

The curves, A, B, and C, Fig. 1, illustrate how the ohm cm. resistance of three different corrosive soils varies with saturation. The field measurements logged soil A as 320 ohms per

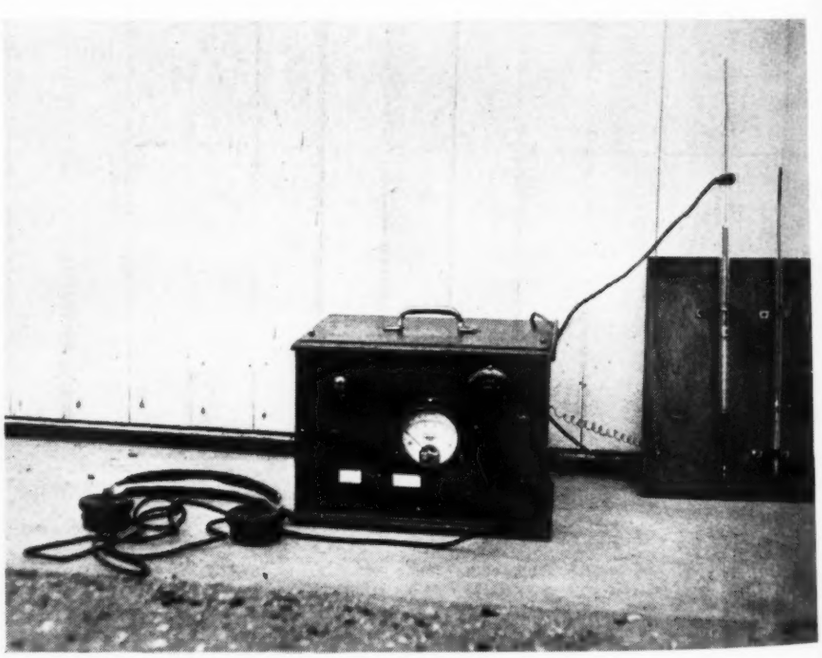


Fig. 2. A-C. wheatstone bridge for measuring the ohm cm. resistance

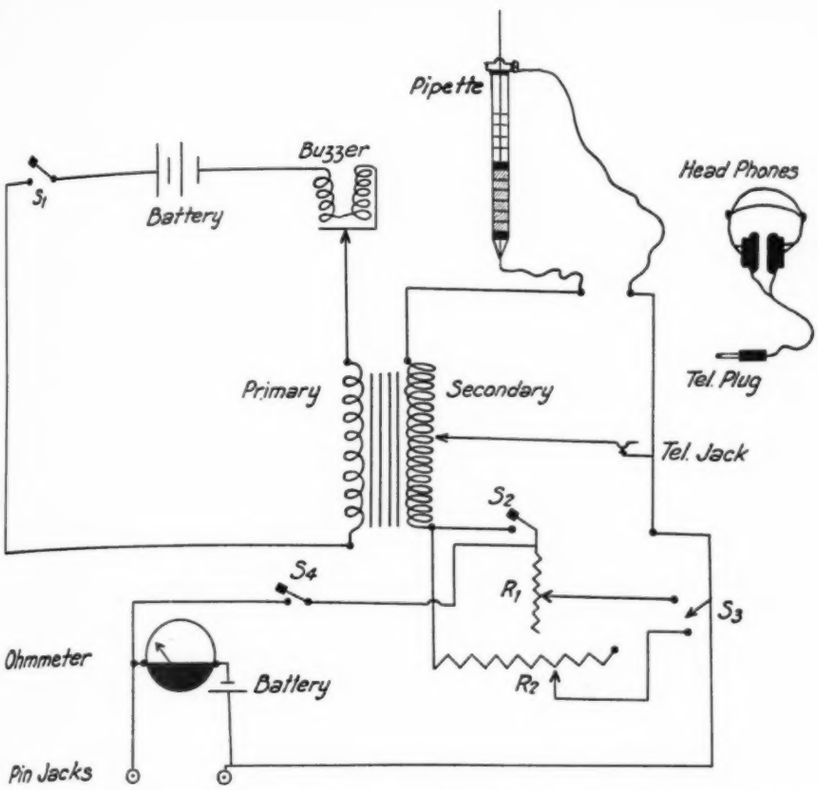


Fig. 3. Diagram of connections of a-c. wheatstone bridge for measuring resistance of soil solutions.

cc., soil B as 435 ohms per cc., and soil C as 1500. Samples of these soils were collected and placed in carton ice cream boxes. They were then thoroughly dried in an oven at an even temperature not exceeding 110 deg. fahr., so as not to drive off any weak organic acids that might be causing a small amount of ionization. Next, they were ground up and screened through an ordinary piece of copper window screen having about 17 meshes to the lineal inch. A finer screen was not used, as it was not desired to grind the soil too fine, since certain otherwise insoluble products might be slightly more soluble should a larger surface be exposed in solution. The resultant powder was measured carefully by the cc. from two to forty-eight, and each quantity placed in 100 cc. of distilled water. The mud thus made was well agitated, and then the solution filtered so that no insoluble material would be held in suspension, as this might be fine enough to shorten the mean free path of the ionizing atoms, and hence retard ionization. The ohm centimeter resistance of the solutions so obtained was measured carefully, and the curves plotted, as shown. These measurements were made on an a-c. wheatstone bridge (to be described later), and since measurements of standard solutions check within plus or minus two percent, it is assumed that they are sufficiently accurate for correlation purposes. It will be seen that after 33 grams of soil had been dissolved in solution, the curve did not rise so rapidly with further concentration. This also is true of both high- and low-resistance soils. It was decided that the only way to put the various soils on a common footing was to make a standard volumetric solution from each one and that this should be chosen beyond the flat peak in the curve. Thirty-five cc. of finely-ground soil accordingly was selected as the quantity to be dissolved in 100 cc. of distilled water. Since this degree of saturation plays such an important role in the measurement of the resistivity of various soils, it was decided to make all measurements in the laboratory where they could be controlled and all soils placed on the same basis. For the last three years samples of soils from pipe depth have been collected and placed in half-pint ice cream cartons where the moisture could evaporate from them at will. A notation concerning the acid, or basic nature of the soil, together with a brief chemical analysis, also were placed on the carton containing the information as to whether the solution contained the following ions that long have been regarded as the principal ones causing low soil resistance: sulphate, chloride, carbonate or acid carbonate, nitrate or dissolved hydrogen sulphide. A test also was run to determine if any iron salts existed in the solution.

These soil samples constitute a permanent record that can be referred to at any time, and should a subsequent sample show lower resistivity from a location of known high resistivity, the cause for this quickly can be ascertained. Several such cases already have

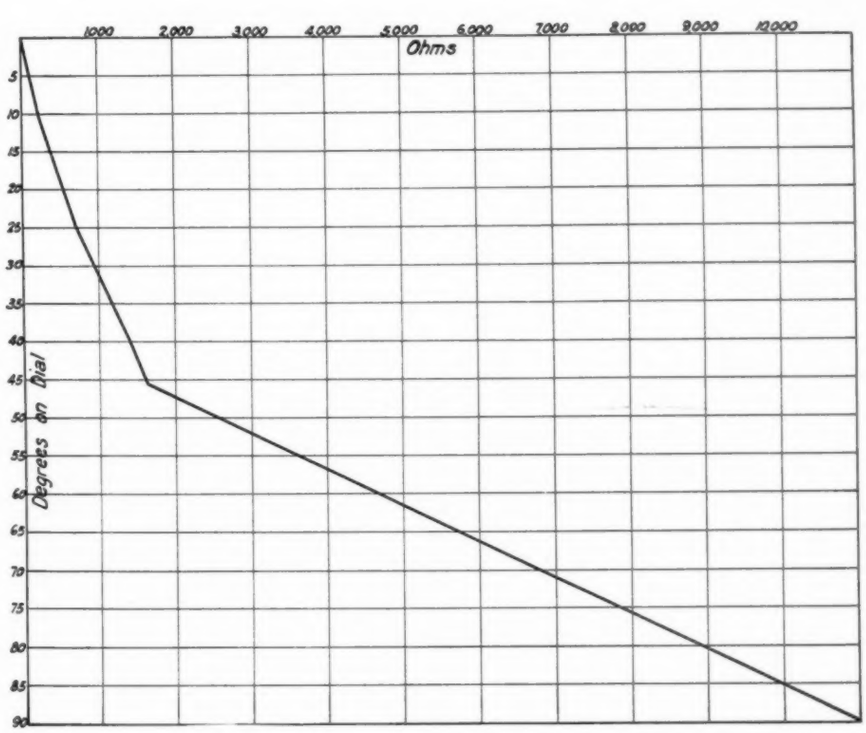


Fig. 4. Calibration curve of high-resistance readings

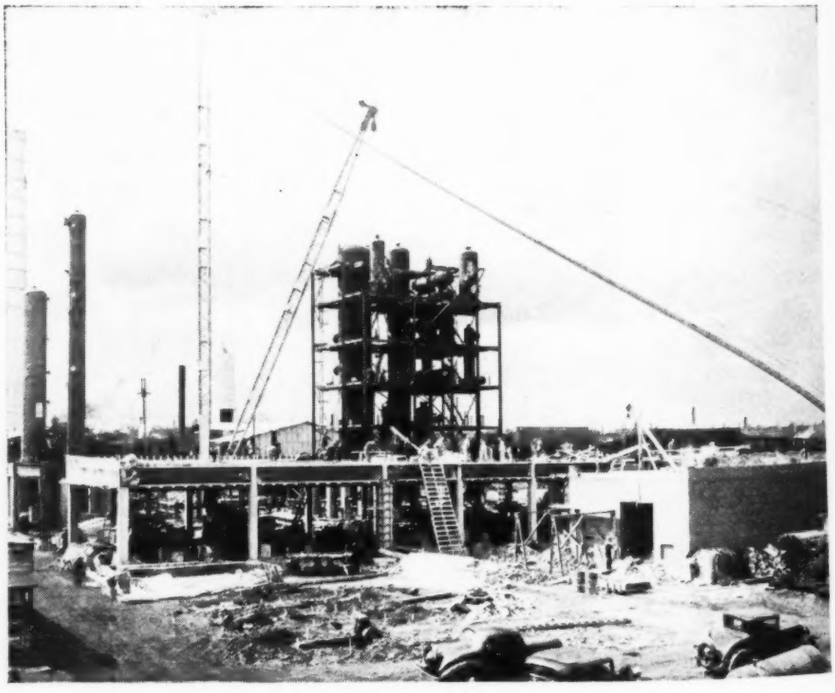
been recorded and in each instance the cause has been traced to some man-made agency that was causing the discrepancy. Roughly, it was found that soils that had a resistivity above 2500 ohms per cc. were non-corrosive, although one soil was found in which the action of a difference of induced potential caused ionization to start and continue to lower until the same soil only had a resistance of about 500 ohms per cc., whereas it normally had a resistance of 3000 ohms.

A good a-c. wheatstone bridge for measuring the ohm-cm. resistance can be built by any corrosion man from parts obtainable from local radio repair supply houses. A picture of this machine and diagram of connections are given herewith, Fig. 2. The instrument will not cost more than $25.00, and all parts can be obtained in any community of average size. Better readings can be made by substituting a 100-cycle vacuum tube oscillator for the mechanical high-frequency buzzer.

Since, by definition, the ohm-cm. resistance of solutions is the resistance of one cc. of this solution as measured between conductor faces one cm. square, it was decided to use a graduated pipette tube of one sq. cm. section. Lead electrodes were ground, so that they just slipped inside this glass tube. One was secured in the bottom of the tube, as shown in Fig. 3, with sealing wax, while the other was placed on a heavy non-flexible copper wire and slid in from the top. A clip was placed on this copper wire so that it could be halted at any desired position, permitting the measurement of from 1 to 25 cc. of fluid. It was found that any uniform diameter tube could be used so long as a conversion factor was established for converting results to the standard surface tube of one cm. square. In the photograph of the apparatus, the tube on the left is the standard tube. The one on the right is much smaller, but worked equally as well once a conversion factor was established.

By referring to the diagram of connections (Fig. 3), it will be seen that this instrument has a dual range. When switch S3 is in the up position, measurements of from 1 to 1000 ohms can be made, and when it is in the down position values from 1000 to 10,000 ohms are measured. The transformer used is a filament lighting transformer for radio receivers. The buzzer is connected through the 5-volt winding, while the 2½-volt-center-tapped winding is used to balance the bridge. When the buzzer is turned on and the head phones plugged-in, the value of resistance R_x can be made equal to either R1 or R2 by varying these and adjusting them to the null point where no sound is heard in the head phones. These resistors are replacement volume controls from radio receivers. When R1 is used on low-resistance solutions a balance is made by throwing S3 to the up position and closing S2. Then S2 is opened and S4 is closed. This throws the direct-reading ohmmeter across R1 without shunting half the secondary of the transformer across the meter through the headphone circuit. At first, a switching arrangement permitted the meter to be thrown across R2 also, and its value also measured, but it was found hard to find an inexpensive ohmmeter that would read these values from 1000 to 10,000 ohms accurately and remain in adjustment. To remedy this, a standard 2-in. radio dial was placed on R2 and its curve plotted for calibrated degrees on the dial against ohms as measured on a precision wheatstone bridge. This curve for this type resistor is shown in Fig. 4. It is very easy to read ohms directly from degrees on the dial. The whole instrument weighs only about ten lb. and easily can be set up at any location where it is desired to make measurements. The small d-c. voltmeter is provided with pin jacks in which plug tips can be inserted and the meter used independently of the a-c. bridge.

Thermal Polymerization Plant Being Constructed at Point Breeze



THERMAL polymerization plant being constructed by The Atlantic Refining Company at its Point Breeze Refinery, Philadelphia, to produce gasoline from refinery gases. With a daily capacity of 62,500 gal. of gasoline, the plant will be the largest of its type in the world, and the first to be built in the eastern United States.

The Stratco PbS Process[1]

By

D. B. NUTT[2] AND J. A. ALTSHULER[3]

THE sulphur present in raw gasolines may occur in the free or elementary state, some as hydrogen sulphide, but the largest amount is present in the form of organic derivatives. This latter group is divisible into two classes, (1) the acidic, and (2) the neutral. The first class includes mercaptans, which, together with hydrogen sulphide, are mainly responsible for the unpleasant odor, and positive reaction to the "doctor" test. The second class includes the organic disulphides, sulphides, and thiophenes, which in general are sweet to the "doctor" test.

Hydrogen sulphide, if present in the gasoline, is removed easily by applying caustic soda solution, since it is a comparatively strong acid and either or both of the hydrogen atoms may be replaced to form metallic sulphides which are water soluble. However, mercaptans are relatively weak acids and sodium mercaptides are hydrolized readily as shown by the reversible reaction: $RSH + NaOH \rightleftarrows RSNa + H_2O$. In other words, unlike hydrogen sulphide, the removal of mercaptans from gasoline by caustic soda solutions is extremely difficult to complete, and other sweetening methods had to be found.

Refiners at an early date turned to the now well-known sodium plumbite and sulphur (doctor) method of treatment in which mercaptans are converted to disulphides through the media of lead mercaptide formation, sulphur being used to oxidize the lead mercaptides to the corresponding organic disulphide and lead sulphide. In order to reduce chemical costs lead sulphide is then regenerated to sodium plumbite. It was soon noticed in commercial practice that the use of regenerated doctor solution frequently resulted in increased ease of treatment, and further, that the explanation of this effect was the presence of some nonconverted lead sulphide in the regenerated doctor solution. This discovery resulted in the development of several methods of lead sulphide treatment. In its earlier form the method was to contact the sour gasoline with a suspension of lead sulphide in sodium plumbite solution, completing the reaction by adding sulphur as usual. Later, Rowsey (1) found sweetening could be accomplished by contacting the sour gasoline with a suspension of lead sulphide in caustic soda solution while blowing air through the mixture; in many cases it was necessary to add sulphur to complete the reaction. The inherent disadvantages of these earlier methods are discussed below.

I. THE STRATCO PbS SWEETENING PROCESS—METHOD OF OPERATION

In attempting to sweeten many gasolines, particularly cracked, using a suspension of lead sulphide in caustic soda, employing not sulphur, it was found that the gasoline suffered a severe darkening and the reagent developed a tendency to carry-over with the sweetened gasoline resulting in large chemical losses. It was determined that these difficulties were attributable to the formation of undesirable concentrations of soluble lead salts within the reagent by the action of the process air on the lead sulphide. Reprecipitation of the lead compounds as lead sulphide was found to eliminate this difficulty.

In the improved PbS method of sweetening, therefore, sour gasoline is intimately contacted with preformed dense and quick-settling lead sulphide suspended in strong caustic soda solution. To this mixture is added a small positively regulated quantity of air for the purpose of activating the reagent; also a sufficient quantity of aqueous sodium sulphide solution is fed continuously to the mixture for the purpose of precipitating all excess soluble lead salts that are formed in the sweetening operation. Thus, the lead sulphide reagent is maintained in a desirable chemical balance, and the sweetening operation is accomplished essentially as a catalytic oxidation under controlled conditions. In this manner consumption of treating chemicals by side reactions is reduced to a minimum.

The operating procedure may be seen readily by reference to the typical flow diagram, Fig. 1. Lead sulphide reagent and sour gasoline, together with small volumes of air are fed into the system through the contacting device. The amounts of the latter depend upon the sourness of the raw gasoline. These intimately mixed constituents pass to a horizontal settler where the reagent settles out. The reagent recirculation pump takes suction on the reagent settled out in the bottom of the settler, and discharges to the contactor; the volume of reagent recirculated varies from 10 percent to 50 percent, or higher, again depending upon the sourness of the gasoline. The sweet gasoline, containing a very small amount of caustic and reagent in suspension, then passes through the rock-packed clarifier and thence to storage. Flow controllers on the feed, air, and sodium sulphide make for ease and utmost simplicity of operation and greatest economy of chemicals.

The most important feature of the operation (and that *upon which* the *improved process* is *based*) is the maintenance of the reagent in a substantially *balanced condition* by continuous addition of the correct volume of sodium sulphide solution. This is most

[1]Delivered before technical session of the twenty-fifth annual meeting of the Western Petroleum Refiners Association, Hot Springs, Arkansas, April 26, 27, 28, 1937.

[2]Research and Development Department, Standard Oil Company of California.

[3]Vice-President Stratford Engineering Corporation.

readily accomplished by the flow controller.

Second only in importance is maintaining the strength of the caustic soda solution. This solution loses strength gradually owing to the addition of the aqueous sodium sulphide solution and the formation of water by the sweetening reactions. It has been found that when the caustic strength falls below a certain minimum, depending upon the character of the stock being treated, treatment becomes more difficult and the tendency of the PbS particles to pass out of the settler with the sweet gasoline increases, resulting ultimately, if allowed to continue, in carry-over of reagent to finished gasoline storage. At such times the *caustic portion* of the reagent is removed from the system and replaced with stronger caustic solution and the sweetening operation is resumed. The operating cycle in this respect varies from ten days to three months, depending upon the character of the gasoline being sweetened and the volume of sodium sulphide solution added. The weak soda solution may be used for hydrogen sulphide removal or elsewhere in the refinery where caustic is required.

It has been found also that after long continued use the reagent decreases in activity, probably because the PbS particles in the reagent become coated with a film. The reagent is then removed from the system and revivified. This procedure consists merely in washing the lead sulphide with hot water and steam for a short time, which results in removal of foreign bodies constituting the film. The clean lead sulphide particles drop to the bottom of the washing vessel, are mixed with strong caustic, and returned to the system for use. The frequency with which the PbS requires washing depends upon the characteristics of the sour gasoline —generally from three to twelve weeks.

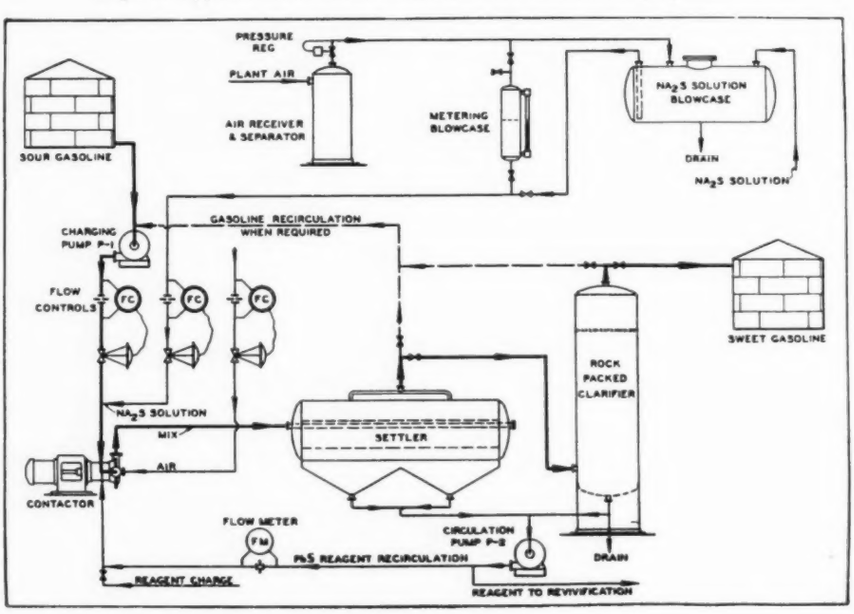
Process air requirements are very low, in general from nil to about 0.15 cu. ft. per bbl. except with high mercaptan content stocks where air requirements may reach a maximum of 1.0 cu. ft. per barrel. The nitrogen and any excess air are removed from the system through an inverted steam trap installed on the settler. This gas may be returned to a vapor-recovery system although experimental work has indicated that the amount of hydrocarbon carried by the gas is almost negligible.

The finely divided PbS and caustic, carried in suspension, in the sweet gasoline entering the clarifier are removed by the coalescing action of the rock, and flow to the bottom of the vessel. The small amount of reagent, accumulating in the bottom of this vessel, is removed about once every eight to sixteen hours and returned to the system.

The several PbS sweetening plants now in operation either run continuously or do the required amount of treating in a part of an eight-hour shift and shut down for the balance of the day. Substantially no adverse effect has been noted during discontinuous operation, as compared to continuous.

The flow diagram does not show the three small tanks normally used for storage of sodium plumbite and sodium sulphide solutions, and reagent preparation (or washing) respectively. Fresh PbS reagent is made by adding the required amount of sodium sulphide solution to sodium plumbite solution so that all the lead is precipitated out of the latter.

Fig. 1. Typical flow sheet—Stratco PbS sweetening system



II. OPERATING RESULTS

Large scale commercial operation of the improved lead sulphide sweetening process over a period of six years has demonstrated the general practicability of the method for treating both straight-run and cracked gasoline and also heavier products. These operations have provided ample opportunity to obtain reliable data on yields, chemical consumption, and effects on quality of the finished products.

Following are results obtained during normal commercial operation using the PbS process for sweetening sour cracked gasoline:

1. Chemical consumption—lb. per bbl. of gasoline (1).

The following figures represent maximum requirements:

Percent mercaptan sulphur (2)	0.01	0.02	0.03
Sodium Sulphide	0.03	0.06	0.09
Litharge	0.0077	0.0085	0.01
Caustic Soda (3)	0.0077	0.0085	0.01

(1) For cracked gasoline and straight-run gasoline containing a lower percentage of mercaptan sulphur than indicated chemical consumption is always less.

(2) Borgstrom & Reid Method.

(3) Net consumption of caustic after credit is given for diluted caustic withdrawn from the system.

2. General.

(1) Low octane losses.

(2) Color drop—nil to three points depending upon crude source endpoint of gasoline, etc.

(3) Satisfactory color stability.

(4) Volumetric loss—not measurable with the exception of that due to evaporation in tankage.

(5) Sulphur—no increase during sweetening.

(6) Copper corrosion test—unchanged or improved.

3. Use of Air for Sweetening.

Considerable interest has been displayed relative to the effect of process air additions during sweetening on the gum content and gum stability of the finished gasoline. It has been found that, within the limits of error of the determination, the amount of air added is so small that its effect on the gum content and stability is negligible.

III. ADVANTAGES OF STRATCO PbS PROCESS

From a study of the available data on sweetening stocks of similar quality in plants where the PbS process replaced the conventional doctor method with efficient revivification procedure, it was indicated that the advantages of the PbS process were approximately as follows:

1. Decreased chemical costs—of the order of 50 percent or more.
2. Decreased octane loss—of the order of 0.5 points CFRMM.
3. Decreased color loss.
4. Decreased volumetric loss—as high as 1.5 percent.
5. Decreased utilities cost—principally due to eliminating regeneration of blackstrap, and avoiding water washing of sweetened gasolines.

Unit costs for chemicals will vary considerably between individual plants, as will figures for stock value, octane value, and utilities but it will be apparent that the potential savings to be realized represent a considerable sum for all plants.

A considerable number of cracked and straight-run gasolines, commercially produced from a wide variety of crude sources, has been examined recently. For purposes of comparison these stocks have been sweetened by the conventional doctor and PbS processes, and in a number of cases, by other lesser-known sweetening methods. A study of the results and review of the processes involved indicated that many of the following advantages can be realized by PbS sweetening as compared to other methods:

1. Minimum chemical costs.
2. Minimum octane degradation.
3. Best color retention.
4. Eliminates the use of sulphur.
5. Negligible losses of gasoline.
6. No corrosive chemicals used.
7. Minimum labor and utilities cost.
8. Continuous and automatic operation.
9. Unusually low plant cost.
10. Inexpensive conversion of doctor plants.

A more detailed discussion of some of the major advantages of the PbS process follows:

1. Eliminates the Use of Sulphur. No free sulphur is required in carrying out the PbS treating operation; therefore, the sulphur content of the gasoline is not increased in the slightest during the sweetening procedure. For this reason the difficulties with regulation of the sulphur feed are removed, and the possibility of producing a corrosive (bad copper strip test) gasoline is eliminated. Furthermore, recent experimental work has shown that the presence of free sulphur, even in amounts that may not be detected readily in the usual determinations, affect adversely both inhibitor susceptibility and tetra ethyl lead requirements. It is known that reports on this subject by several investigators are in preparation and will be published shortly.

2. Losses—Gasoline and Reagent. The losses of finished gasoline by the PbS process are negligible by reason of the type of operation (closed system, etc.) and the fact that no emulsions are formed during the operation, and that it is not necessary to regenerate blackstrap. No lead in any form is consumed chemically in the PbS process. All lead losses are mechanical.

3. Minimum Labor and Utility Costs. The process requires no more labor than a conventional doctor-sweetening operation. With experienced operators and with automatic controls, the labor and supervision required usually are materially less than in a doctor plant.

The cost of all utilities required by the PbS process is decidedly less than for conventional doctor sweetening. No air is required for external revivification, and very little steam. In contra-distinction the cost of steam and air required for blackstrap regeneration has often been found to be nearly equivalent to the cost of chemicals required in the sweetening operation. Furthermore, in substantially all sweetening processes, the sweetened gasoline is washed with water or chemical solutions prior to leaving the plant. This final wash is eliminated in the PbS process.

4. Continuous and Automatic Operation. The operation of the PbS process is continuous and automatic. Consequently the consumption of chemicals can be readily held to a minimum, and chemical control is reduced to the utmost simplicity.

5. Plant Costs—Conversion of Existing Doctor Plants. It will be noted from the flow sheet that the design of plants utilizing the PbS process is extremely simple and that existing doctor plants can be converted to the process cheaply and without difficulty. In practically all cases, most of the equipment can be utilized in making the conversion.

IV. MECHANISM OF REACTIONS

In conclusion, the question of mechanism of the PbS sweetening reaction has arisen many times. It appears that there are three schools of thought on the subject. Briefly, they are:

1. Variations of the Well-known Doctor-Treating Reaction. The basic reactions of the conventional doctor-treating process and blackstrap revivification are well known. Drs. Morrell and Faragher (2) have published several articles of outstanding merit in this connection, presenting data to indicate that PbS treating is a special case of doctor-treating. Ott and Reid (3) have a different hypothesis, considering sodium plumbite as lead hydroxide and show experimental data indicating that both basic and natural lead mercaptides may be formed. These may be oxidized either with sodium sulphide or free sulphur to form the disulphides.

2. Catalytic Oxidation. Wendt and Diggs (4) in an early article assigned a catalytic role to the suspension of PbS in caustic, the lead sulphide not entering the reaction but acting as a catalyst to promote the oxidation reaction

$$4RSH + O_2 \rightarrow 2R_2S_2 + 2H_2O.$$

3. Adsorption. Wendt and Diggs in a later article, and Slagle and Reid (5) in a recent publication, reported that PbS was capable of adsorbing more than 25 percent by weight of mercaptans.

However, though all the various hypotheses explain some of the findings noted during several years of commercial operation, none of them individually explains all the phenomena. It is believed that an explanation of the mechanism of the reaction probably lies in a summation of all three. The important fact is that the use of the Stratco PbS process, employing substantially balanced reagent, on sour gasoline will insure the production of a sweet gasoline of highest quality at an extremely low overall cost.

References

1. Rowsey and Whitehurst—*Oil and Gas Journal*, December, 1927, Page 250.
2. Morrell and Faragher—*U. O. P. Bulletin*, "The Role of Lead Sulfide in the Sweetening of Petroleum Distillates."
3. Ott and Reid—"Reactions of Mercaptans," "The Autoxidation of Lead Mercaptides." Preprints of articles presented at the Atlanta Meeting of the American Chemical Society, 1930.
4. Wendt and Diggs—*Journal of Industrial and Engineering Chemistry 16*, Page 1114, 1924.
5. Slagle and Reid—"Adsorption of Mercaptans by Copper Sulfide and other Sulfides." Preprint of article presented at the Atlanta Meeting of the American Chemical Society, 1930.

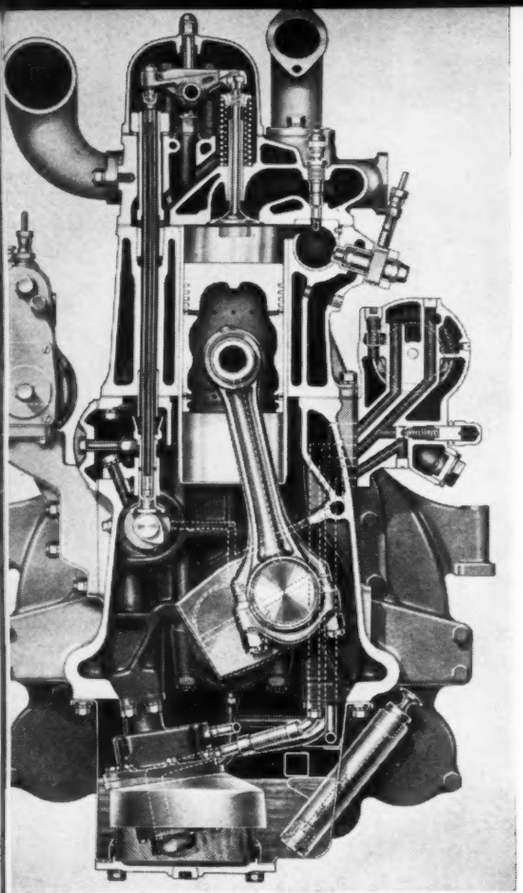


Fig. 1. Cross-section (side view) of high-speed Diesel. Note design of ante-chamber for producing turbulence

The Fuel Mixing Problem in the Diesel Engine

Turbulence, Atomization, and Vaporization of the Fuel Mixture

By ORVILLE ADAMS

IT IS common knowledge that, in the Diesel engine, ignition of the injected fuel immediately following injection is necessary. If this rapid ignition is to be obtained the fuel must reach its ignition temperature in an interval of time so short as to be measurable only in thousandths of a second. The fuel must be injected into an atmosphere the temperature of which is higher than the ignition temperature of the fuel, and this temperature is obtained by means of high compression. Fuel oil is hard to ignite, and, therefore, the air in the combustion chamber must be under greater compression in the Diesel than in the gasoline engine to generate sufficient heat to fire the fuel. In the carburetor engine, on the other hand, the fuel is introduced into the cylinder during the compression stroke. In order to avoid spontaneous and uncontrolled ignition in the gasoline engine, it is necessary to keep the temperature, and consequently the compression ratio, relatively low. In the carburetor engine the heating of the fuel is objectionable, but in the Diesel engine *it is very desirable.*

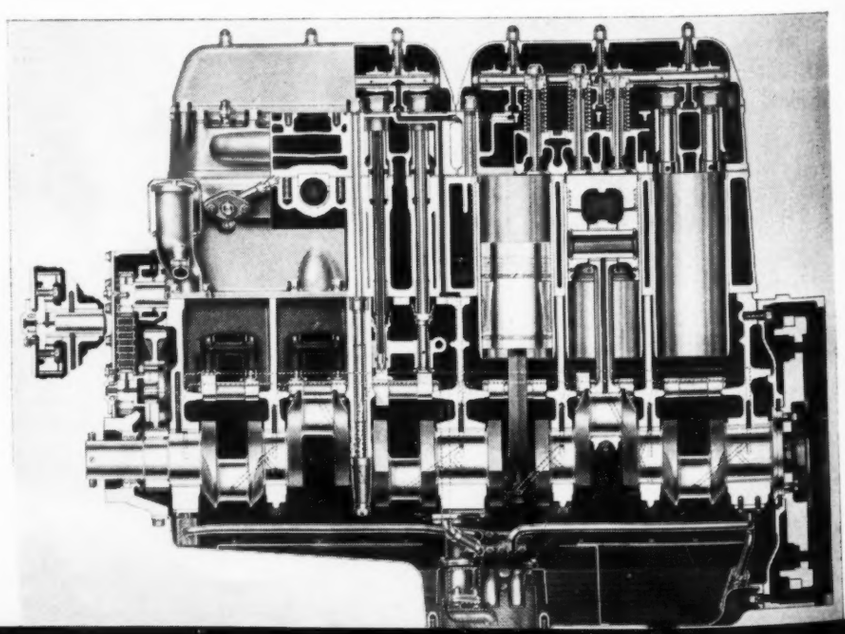
Fig. 2. Cross-section (front view) of 6-cylinder Diesel shown in Fig. 1

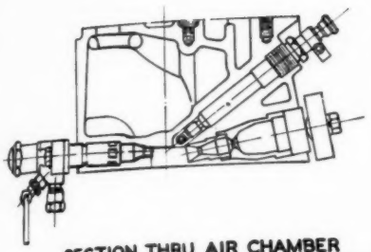
The Fuel Problem in Diesel Engines

Obviously, the heating of fuel is a question of temperature, but it must not be overlooked that it also is a question of time. In a carburetor engine the fuel picks up heat from the walls of the combustion chamber during 360 deg. of the suction and compression strokes, the fuel being exposed to the heat of compression during the whole of the compression stroke. Let us recall that the factor that limits the output of an engine of a given size is the air. It is possible to supply an almost unlimited quantity of fuel to an engine, but the air supply is limited by the swept volume. It is necessary, therefore, to make the best possible use of air. In the carburetor engine this is rather an easy matter. The fuel is supplied to the cylinder during the suction stroke and there is sufficient time in which to mix the fuel with the air, evaporating and vaporizing it thoroughly, so that at the end of the compression stroke there is a homogeneous gas mixture ready to be ignited. When the spark ignites this mixture, one of the most efficient processes of combustion and flame propagation known to science occurs. But in the Diesel engine the mixing of the fuel with air is a rather difficult problem, and much of the development work on the Diesel engine has been concentrated on this problem. In fact, it is two problems:

1. The fuel must be measured accurately and evenly over long periods of operation, and injected in small quantities into the various cylinders during the working stroke.

2. The fuel must be prepared before injection, so that when it is injected, the charge enters the combustion chamber already prepared for rapid and complete combustion, otherwise it is not possible to obtain perfect ignition and combustion of the fuel in the high-speed Diesel engine. It is necessary for the injected fuel to be evenly distributed throughout the air charge in the combustion chamber, and in order to obtain this distribution the combustion chamber has been formed so as to suit the shape of the spray, the air charge has been given a rotating, whirling, or turbulent movement, and various kinds of precombustion chambers have been used. It is a well-known fact, however, that the Diesel engine does not utilize the air very efficiently, and for most designs it is necessary to supply a considerable amount of excess air. The reasons for this are obvious. There are two factors that control the mixing of the fuel and air, one is space, the other time. The first factor is usually well taken care of in most engines. The matter of time, however, cannot be taken care of so easily in a Diesel engine because it is necessary for the proper operation of the average engine that the fuel be burned immediately





SECTION THRU AIR CHAMBER GLOW PLUG AND FUEL INJECTION NOZZLE

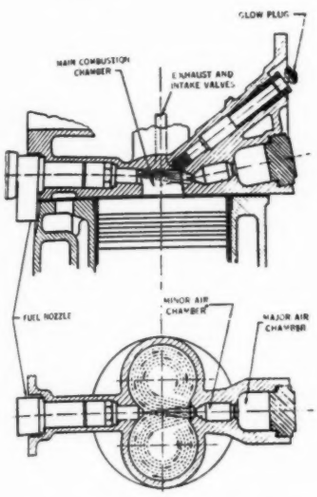


Fig. 3. Sections showing details of air-chamber designed for controlled turbulence

it comes in contact with the air in the combustion chamber. Only the first fuel injected comes in contact with fresh air. The fuel thereafter has to be injected through air that already has been utilized. This brings about a condition wherein some parts of the combustion chamber contain more fuel in a given space than can be burned without smoke, whereas in other parts of the chamber there is a surplus of air that cannot be reached by the fuel and utilized. To overcome this problem designers, instead of bringing the oil to the air, bring the air to the oil by various methods whereby a whirling motion is imparted to the air flow, creating turbulence.

There are many shapes of combustion chambers. Designers have attempted to produce ideal conditions by simulating the efficiency of the air-injection engine. The object of most designs is to create the turbulence so easily attained in the air-injection engine with a simple disc-type combustion space and bring about the high degree of vaporization attained in the air-injection engine. When this degree of vaporization can be attained by the design of the combustion chamber or by the method of preparing the fuel for injection and ignition, rather than depending upon extremely high injection pressures, the designer has attained a great measure of success. The purpose of turbulence and fuel mixing methods are to increase the rate of heat transfer between the air in the combustion chamber and the atomized fuel by virtue of violent agitation that promotes more intimate mixing of the combustion chamber contents during the injection and ignition periods. Either turbulence or a high-injection pressure through multiple-hole nozzles is required to prevent a fuel fog from stagnating around the spray orifice, thus leaving the remaining parts of the combustion air without fuel saturation, a condition that would retard the speed of combustion or flame propagation throughout the combustion chamber. This delay of the combustion process produces after-burning, and lowers to a great extent, the effective capacity of the engine. Maintenance troubles and high repair costs result; hence, after-burning must be prevented in the basic design of the engine if it is to be commercially practicable.

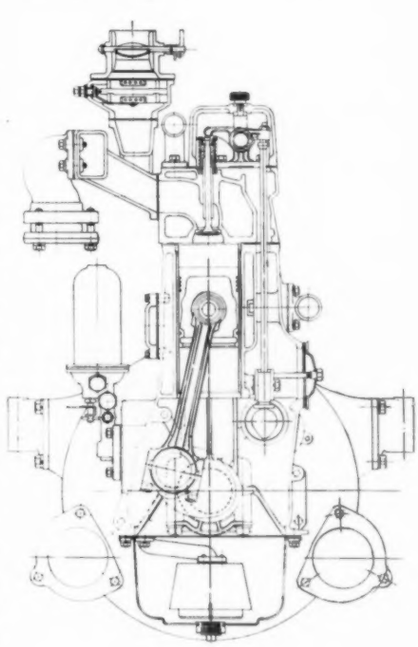
The principal method of bringing about a more intimate mixture of fuel and air is the use of the pre-combustion or pre-ignition chamber. In this type chamber, fuel is injected into the chamber inserted in the cylinder head and from there is blown into the main combustion space, directly over the piston by initial pressure caused by partial combustion of the fuel before its entrance into the combustion space. The space in the pre-combustion chamber is closed almost entirely by being connected with the cylinder space by one or more small holes. Many chambers of this type consist of a cavity, usually in the cylinder head, with a volume of approximately 30 percent of the total clearance volume. The advancing piston forces the air into this chamber where it meets the oil spraying in from the fuel injector. The heat vaporizes the fuel, mixes and ignites it, whereupon complete ignition occurs when it is forced into the main combustion space above the piston. These various methods of preparing the fuel charge before ignition are different in purpose and are called turbulence chambers, pre-ignition chambers, pre-combustion chambers, chamber with air cell, combined turbulence- and air-cell, combination pre-combustion chamber, turbulence chambers, etc.

The pre-ignition chamber, it will be seen then, has several functions: (1), To foster and direct the initiating of ignition; (2), to distribute and mix the fuel throughout the combustion air supply; (3), to aid in putting the fuel in a proper combustible form or condition by warming it, or to supply hot air and thus aid combustion and produce vaporization. The first two functions are intended to be fulfilled in all types of chambers of this class; the third function is performed by means of a special combination of the air chamber and the method of injection of the fuel, as will be explained.

In one type or class of precombustion chamber, the fuel is fed into the neck of the chamber, the chief function being that of fuel atomization and distribution. The air trapped in the ante-chamber during compression, together with the gases from a small amount of combustion that occurs within the chamber, serves to spray the fuel injected at the mid-point of the chamber, similar to the effect produced by an air-injection blast.

Where the usual ante-chamber serves as a pre-ignition or a pre-combustion chamber all fuel is made to pass through the chamber. When the chamber is small and contains only sufficient air to burn a fraction of the fuel injected into it, the resulting partial combustion blows the fuel out of the ante-chamber through holes or grids and serves to produce rapid flame distribution of the unburned fuel throughout the main combustion space in a manner similar to the carburetor engine. The more complete this vaporization in the precombustion cham-

Fig. 4. Cross-section (end view) of Diesel engine whose air-chamber is shown in Fig 3



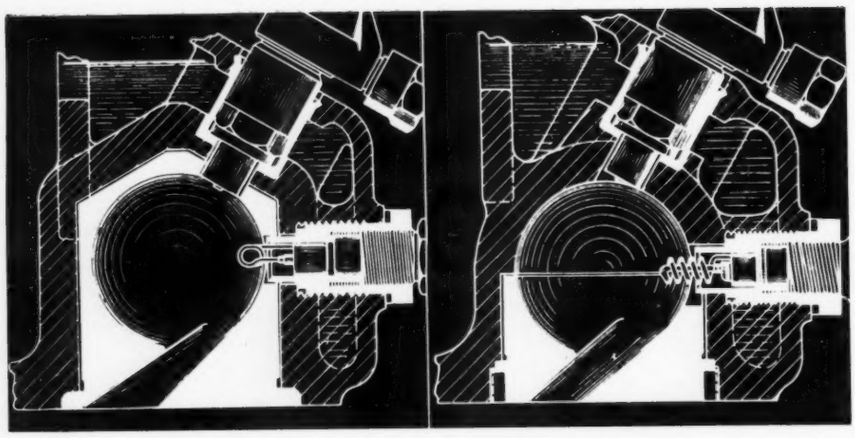


Fig. 5. Former construction

Fig. 6. Present construction

One method of rotating violently the combustion air to obtain complete combustion

ber or air-cell, the more successful is the combustion that follows.

When the ante-chamber is large and serves as a vaporizer and ignition chamber for most of the fuel it is essentially akin to the early designs known as the hot-bulb engine. In this case the ante-chamber has a large neck and discharges a large mass of flame instead of a small mass as in the small-neck type, or small streams of flame as in the multi-orifice type.

Thus it can be seen that the main problem, particularly with high-speed Diesel engines, is to provide ample time for injection, formation of an inflammable mixture, and ignition before the piston has moved too far on its out-stroke, and without having ignition occur too early on the in-stroke. The greater the variation in r.p.m. and load the more involved becomes the problem. The time required for making the combustible mixture and the time lag of ignition depends in part upon the available heat and its temperature. It is found by many designers to be desirable to create what may be called a pilot quantity of fuel vaporization in order to reduce time lag of ignition, and this is produced in numerous ways. Usually a pilot quantity of ignition occurs in many designs of ante-chambers, as well as partial vaporization, vaporization and ignition thus occurring simultaneously.

Progressive Turbulence

The greatest degree of turbulence is necessary in the high-speed engine to bring the fuel in intimate contact with the oxygen of the air. A highly-developed design is shown in Figs. 1 and 2. A combustion chamber is situated at the side of each cylinder, as shown. As each piston is completing its compression stroke, the temperature of the compressed air steadily rising to where it ignites the fuel as sprayed into the air in this chamber. Combustion begins before the piston reaches top dead-center and is completed at 20 deg. past top dead-center, producing a controlled, progressive burning that gives a very high expansion ratio while keeping maximum pressures within reasonable limits. To prevent the simultaneous ignition of the entire fuel charge with its consequent combustion knock, this precombustion chamber has been highly developed. The completeness of combustion, as well as consequent high effective power production, results from this progressive and increasing turbulence, as will be explained. In order to insure rapid and complete mixture of the fuel-oil particles with the oxygen of the air, a violent turbulence of the air is produced in the combustion chamber at the time the oil is burned. In some designs this is a slowing-down period, or a deceleration of this air turbulence at the critical point, just as the piston approaches the top center and at the time the fuel is injected; however, due to this peculiar combination of turbulence, the period of fuel injection is the period of greatest turbulence. This is due to the fact that the combustion chamber is spherical in shape and has a tangential passageway opening into the side of the cylinder. As the piston reaches the end of its travel, it closes the connecting passage, thereby forcing the air through the aperture of the reduced area with what might be termed cyclonic velocity. Thus at the critical time of injection and combustion (top dead-center of the piston) this design accelerates all important functions of turbulence.

Controlled Turbulence

Another late design embodying many of the desirable characteristics of the practical Diesel engine is shown in Figs. 3 and 4. The chief characteristic, and one of the most desirable, is "controlled turbulence." The desirability of controlled turbulence, and hence controlled combustion, is obvious. One of the principal difficulties in satisfactory operation of the Diesel engine results from high pressures in the cylinders with the consequent wearing effect on bearings and all working parts that arise from high peak loading. It is asserted that much of this has been successfully overcome by controlling turbulence by the Lanova system of combustion, which makes possible a much lower pressure without sacrificing good combustion, power, and economy. The fuel leaving the nozzle and passing along the common center of two lobes, the latter formed under both valves, inlet and exhaust, and directly over the cylinder proper, passes through the hot compressed air that is generated in the compression stroke, into minor and major air chambers or what might be called energy chambers. The fuel mixture, fuel in conjunction with the air picked up in the passage of the fuel, passes through a venturi type orifice, causing violent combustion upon its entry into the "energy" chambers. The fuel-air mixture that is ignited in these energy chambers discharges back violently into the main chamber or combustion space above the piston, thus impinging on such residual fuel spray as is still leaving the nozzle or is in suspension. This counter-flow, backfire, or reversal of the contents of the energy chamber sets up a violent turbulence, which is divided in such a manner as to create a right and left rotary motion in that lobe under each respective valve. This brings about what is called "self-induced turbulence", which thoroughly mixes all atomized fuel with its proper quantity of air. Combustion, being already under way, proceeds in the desired manner.

This system of induced turbulence from internal means gives what has been long sought for in the solid-injection engine, a substitute for the air-injection effect. It also produces accelerated burning and progressive rise in pressure by accelerating the end of the combustion cycle instead of the beginning, and thus more closely approaches the character of the gasoline engine.

DEVELOPED THROUGH 50 YEARS TO MEAN A GREAT NAME IN WRENCHES

TRIMO

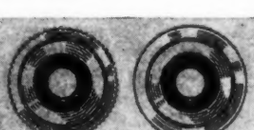
Made throughout of Chrome Molybdenum Nickel Alloy Steel. Drop Forged. Known throughout the oil fields as the Standard of Safety.

•

TRIMONT MFG. CO., INC.
ROXBURY (BOSTON), MASS.

New TRIMO ALLOY PIPE WRENCH
MADE ENTIRELY OF HEAT TREATED CHROME - MOLYBDENUM MANGANESE & NICKEL STEEL ALLOYS

Look for the Red Tag always attached to every TRIMO Pipe Wrench. It is your identification of TRIMO Quality.



TRICROME CUTTER WHEELS

Thin Blade Special Analysis Steel — silvered to resist rust, identified by Red Hub. Fit Trimo Barnes Saunders Cutters.

TRIMO CHAIN WRENCH

Replaceable parts, quality steel, make this chain wrench safest and most serviceable.

The Air-cell and Organized Turbulence

Another method of rotating violently the combustion air to obtain complete combustion, known as "organized turbulence," is shown in Figs. 5 and 6. The combustion chamber is designed so that the throat connecting the spherical combustion chamber with the cylinder is situated on one side of the sphere. As a result of combustion there is a natural rise in pressure in the cylinder, forcing the piston to descend on its working stroke.

The combustion chamber of the Comet type engine, designed by Ricardo with a view to eliminating the Diesel knock, also employs this organized turbulence method by use of the air-cell. The chamber is of two-piece construction. The upper half of the cup is integral with the head, the lower half is of Hoskins metal and is held in place by a loosely-threaded bronze lock ring. This construction provides for good heat regulation at the cup and around the water-jacketed injector nozzles and makes it possible to inspect the inside of the combustion chamber, as well as permitting the chamber throat to be operated at higher temperatures than otherwise would be possible.

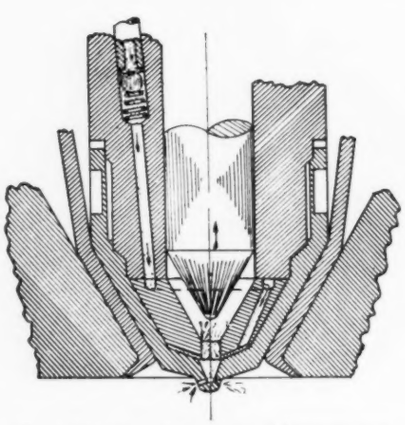
In outside appearance, the combustion chamber is cylindrical and has a flanged bottom. The inside of the combustion chamber is a spherical air-cell. This is approached tangentially by a venturi-shaped throat that connects the engine cylinder with the combustion chamber. The working principles are as follows: 1. The piston coming up on its compression stroke forces the air through the throat and into the spherical air-cell where it is compressed to a pressure of approximately 550 lb. per sq. inch. The clearance between the top of the piston and the cylinder head is between .040 and .050 in., therefore all air in the cylinder except that in this very narrow clearance space is forced into the relatively small combustion chamber and the throat leading to it.

2. The tangential relation between the throat and the combustion chamber forces the air to "swirl" around the vertical axis of the combustion chamber; and passing the injector in that manner it sweeps it with air at all times. The heat loss through the tangential port due to high-velocity air flow is reduced to some extent by fitting a heat-insulating "hot plug." This contains not only the tangential port, but also the lower half of the spherical chamber. This "hot plug" also assists in reducing the delay period, thus giving smoother combustion.

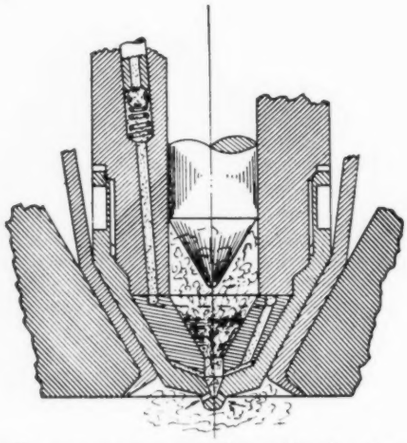
3. The high-speed swirling action of the air is the result of the chamber design. This assures the injected fuel of being mixed immediately and intimately with the air, permitting high-speed operation, clear exhaust, and high-power output. The speed of the swirling air is in direct proportion or relation to the engine speed, which in itself is a governing device for the period of combustion.

The ante-chamber is fitted with an electric glow-plug for starting purposes.

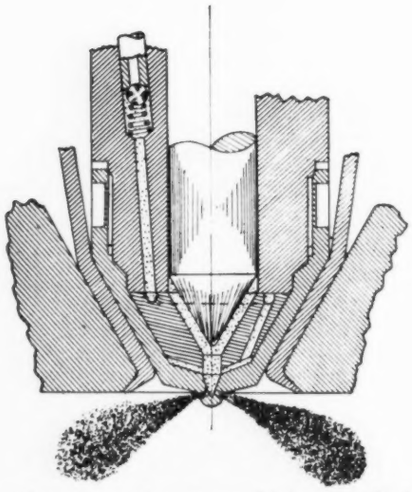
Fig. 7



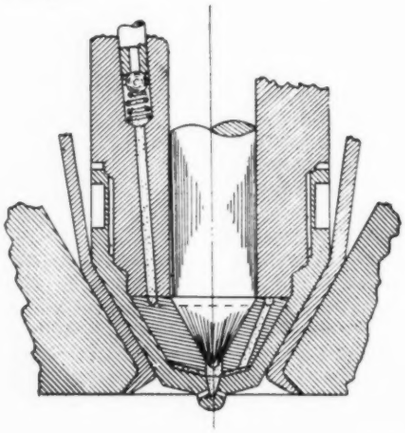
Fuel check valve open. Plunger moving up and fuel entering plunger chamber



Plunger at top position. Check valve closed. Correct amount of fuel in plunger chamber, hot air from compression being forced through fuel charge



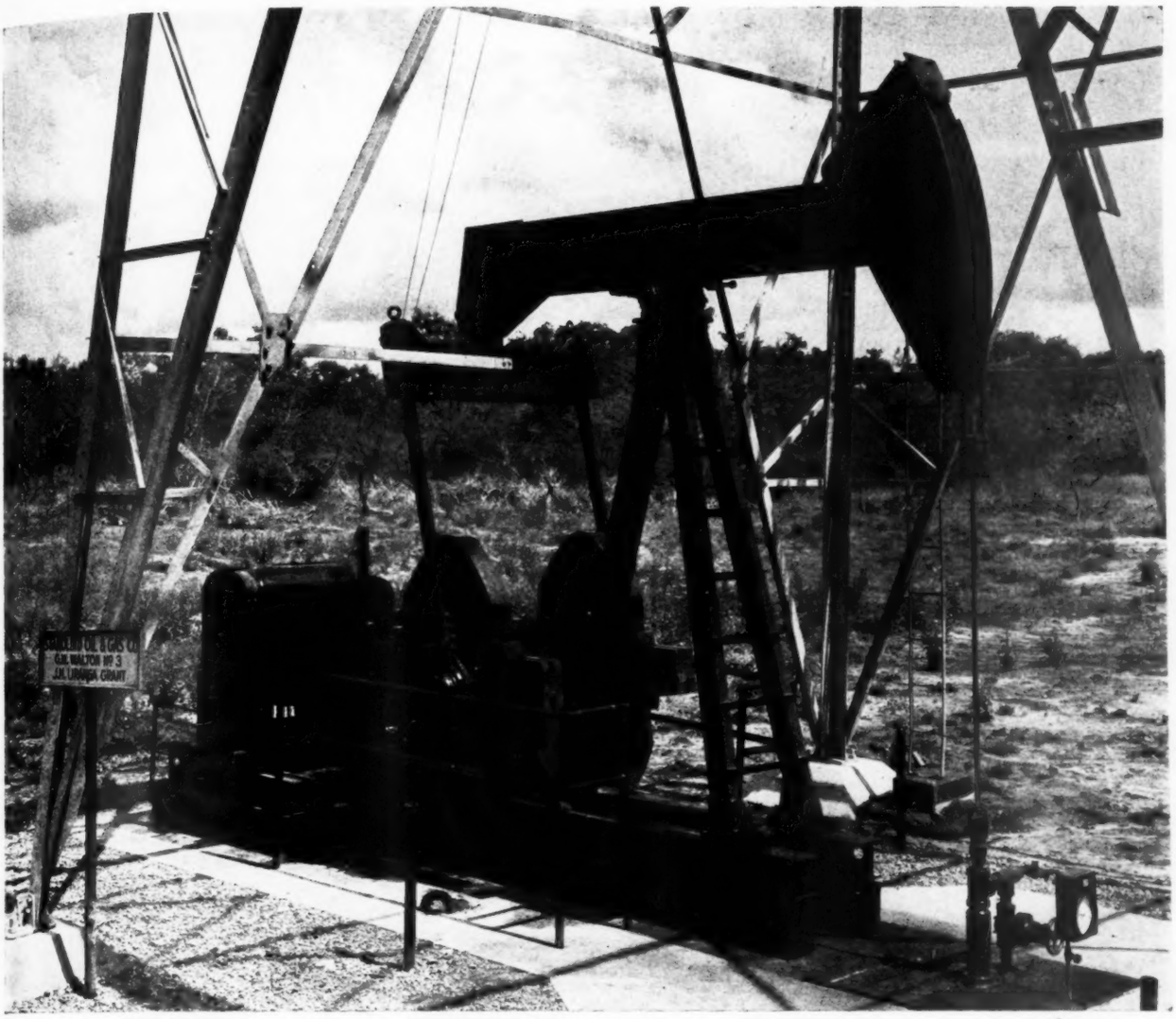
Plunger moving down driving gasified fuel charge into combustion chamber



Plunger seated and injection finished

Vaporizing Pre-Combustion Chambers

This type of pre-combustion or pre-ignition chamber gives violent turbulence and intimate mixture of the fuel and air in both the ante-chamber and the cylinder. The engine thus works efficiently with a weak fuel-air mixture, that is, an excess of air, and the exhaust is smokeless. Positive ignition at all loads and speeds is accomplished by always burning the same amount of fuel in the chamber and thus maintaining high temperature. The radiating surface is so limited that adequate temperature is available at all times for positive ignition. It provides for preparing the fuel for final combustion by partially burning it in the pre-combustion chamber. When the fuel injection valve sprays the fuel into the pre-combustion chamber in the form of a mist, the highly-heated air causes a small portion of the fuel to ignite. As the injection continues, the fuel is enveloped by flame, the entire mass becomes gaseous, and, by virtue of high pressures developed, rushes at high velocity into the main cylinder chamber where further and complete combustion occurs. Expansion then takes place and the rest of the fuel injected is changed into a rich, dry mixture, passing into the



Watch Lufkin!

— A BY-WORD OF THE OIL INDUSTRY

As pioneers in the development of gear reduction units for oil well pumping, the oil industry has naturally and rightfully looked to "LUFKIN" for leadership in the furnishing of the finest and most efficient equipment to be had for this job . . . and, by concentrating all of our time and effort to the perfection of machinery for this task, we feel no hesitancy in inviting the industry to continue to "WATCH LUFKIN!"

At no time in the past were we in position to do a better job. Our policy is one of continual improvement. So . . "WATCH LUFKIN!" and you'll see the parade of "tomorrow's" equipment today!

Lufkin Units are manufactured in Lufkin, Texas, by the Lufkin Foundry & Machine Company . . . branches in Houston, Dallas, Tulsa, Los Angeles, New York City, Kilgore, Longview, Alice, Odessa, Bakersfield, Oklahoma City and Great Bend.

LUFKIN PUMPING UNITS

main combustion chamber at high velocity. A high turbulence is created in the cylinder combustion space, causing the gaseous fuel to become thoroughly mixed with the oxygen from the incoming air, the condition necessary for complete combustion.

It is seen then that an ante-chamber can be so designed as to have a higher temperature than could be allowed for the main combustion space and cylinder walls. For variable load, the volume of the combustion chamber of the ante-chamber type can be designed for the combustion of somewhat constant volume of fuel, and hence maintain a constant temperature. This is accomplished by making the volume of the ante-chamber smaller, small enough so that at idling load all the fuel charge will not be burned because of lack of oxygen. Heating and cooling depend on time, and with a variable speed (r.p.m) care is necessary to control the temperature.

Positive Pressure Pre-Combustion Chambers

Instead of using the pressure rise, resulting from partial initial combustion within the ante-chamber or air-cell, to force the fuel out, another type of chamber employs cam-actuated plungers to displace the fuel from the chamber into the cylinder space. The plunger moves outward during the suction stroke of the engine, the fuel being sucked into the small space under the end of the plunger. Actuated with a cam, there follows a quick downward movement of the plunger, forcing the fuel, air, and vapor into the main cylinder space. Two conical cups are used, with the plunger seated on the inner cup by the action of the cam. A fluted projection on the inner cup causes a thin space to be left between the two cups, the fuel being delivered to this space through a small spring-loaded ball check valve. The fuel is then sucked into the flutes by the upward movement of the plunger. The back-flow or return of the fuel during the injection stroke is prevented by a check valve. The fuel is ejected into the cylinder through fine orifices drilled in the outer cup. It is evident that the thin walls are subject to high temperature, with the fuel remaining in the cups a considerable length of time, a condition that undoubtedly results in vaporization while the fuel is under the plunger. This plunger also sucks in some air from the working cylinder during the compression stroke of the piston. When injection begins the liquid fuel standing in the lower part of the cup is first to be expelled, while at the end of the process the discharge of the air and vapor evidently sweeps the orifices dry and protects them from incrustation of carbon that would result if the oil were not completedly dispelled at each stroke.

As shown in Fig. 7, after the pump has measured the proper fuel charge and delivered it to the injectors, the fuel is preheated or warmed by circulation through a preheating chamber in the end of the injector before entering the combustion chamber. It is then forced into the injector at a point directly above the nozzle, and on the compression stroke it is further gasified; then, with the piston near the top center, the plunger is suddenly depressed by the proper cam action, driving this preheated charge of gaseous vapor back through the nozzle into the combustion chamber, where ignition takes place.

Cast Iron and Its Recent Improvements

THE New Jersey Chapter of the American Society for Metals joined with the New York, Philadelphia, and Lehigh Valley chapters in a "Symposium on High Test Alloy Irons" at its May 14th meeting. Their guest speakers were J. S. Vanick, who presented a brief record of high-test cast iron alloyed with nickel and summarized the progress that has been made in its processing, alloying, heat treatment, and applications during the last 20 years; C. O. Burgess, and N. F. Tisdale who discussed chromium and molybdenum alloys, respectively.

Engineers dealing with the design and construction of industrial equipment are constantly striving to improve their output by applying refinements in materials, assembly and finish destined to deliver a better or more economical product. Foundrymen today are more concerned than ever with improvements not only to the quality of their output but to production technique. As a result, improved cast irons have been especially developed for specific applications where strength, rigidity, and resistance to heat, wear, and corrosion are primary requisites.

In this country today, from 10 to 15 percent of all iron castings produced are alloyed and almost one-third of the iron foundaries operating are users of alloys for at least a portion of their castings production.

At this meeting particular emphasis was placed on the development of properties and uses of high-test types of alloy cast irons suitable for castings requiring great strength or subject to high stressed conditions and possessing a high degree of resistance to fatigue, torsion, and impact. Special types of high-strength cast irons used extensively for gears, valves, heavy frames, heavy machine tool spindles, and many other applications where the utmost strength consistent with machinability is required also were discussed.

Vanick is a member of the Development and Research Division, The International Nickel Company, Inc. On April 30 he also addressed the Philadelphia Chapter of the American Society for Metals. His subject was "Modern Cast Irons."

12 IMPROVED COMPRESSOR PLATE VALVES

1 EFFECTIVE SCAVENGING

2 INSTANT REGULATION

3 ACCURATE FUEL ADJUSTMENT

4 COMPLETE ACCESSIBILITY

5 LONG LIFE CYLINDER HEADS

6 CONVENIENT SCALE REMOVAL

7 POSITIVE COOLING

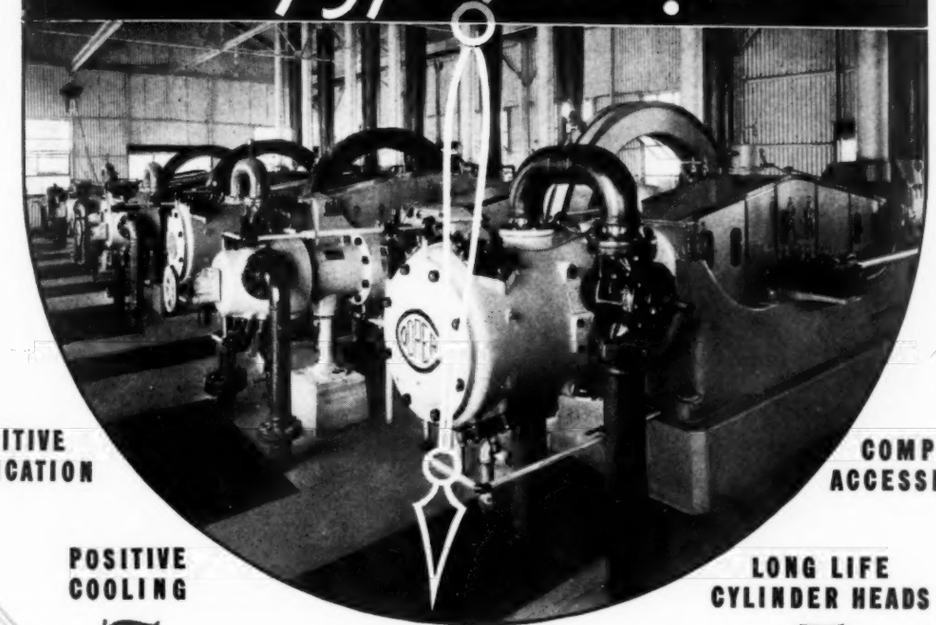
8 POSITIVE LUBRICATION

9 SEPARATE MAGNETOS

10 INVERTIBLE EXHAUST

11 ADJUSTABLE BEARINGS

TAKE *Time* TO LOOK INTO THESE TWELVE MODERN FEATURES OF THE COOPER-BESSEMER *Type* 12!



THE COOPER-BESSEMER CORPORATION

Mount Vernon, Ohio — PLANTS — Grove City, Pennsylvania

25 West 43rd St. New York City | Mills Building Washington, D. C. | 640 East 61st St. Los Angeles, Calif. | 201 East 1st St. Tulsa, Oklahoma | 631 Spring St. Shreveport, La. | Magnolia Bldg. Dallas, Texas | 53 Duncan St. Gloucester, Mass. | Esperson Bldg. Houston, Texas

Dirt and steel shavings being blown into the air from the pipe line to which an angle-joint had been attached

By
H. B. DEMPSEY
Lone Star Gas Company, Ranger, Texas, District

Unusual Method for Cleaning Interior of Pipe Line

AN unusual method of cleaning a high-pressure pipe line of abrasive materials that had accumulated in a compressor suction line and resulted in damage to compressor station machinery, was given a successful test recently in the Ranger district of the Lone Star Gas Company pipe line department. A portion of the line tested has been in service 15 years and is approximately 25 miles long. It serves as a suction line running from the South Bend and Oil City fields in northern Stephens and Young counties in Texas to the Lone Star compressor station at Breckenridge.

The line had accumulated a large amount of sediment, so much, in fact, that it was impossible to apply successfully the usual method of cleaning. Consequently the sediment had begun to pass the cleaner and get into the compressors at the Breckenridge station, causing damage to valves, rings, pistons, and cylinders.

The line was divided into sections of about five miles each. A cross-over line was laid from a high-pressure gas line to the line that was to be cleaned. A joint of pipe was cut out of the line past the cross-over connection and a lubricating joint was installed that consisted of a 6-in. welded blow-off with a 3-ft. nipple.

On the outlet end of the 5-mile section to be cleaned a joint of pipe was cut out of the line and an angle-joint was installed that turned the dirty gas into the air at about a 45-deg. angle. As pressure was applied to the inlet end of the line about 15 gal. of steel cuttings, obtained from a machine shop, were introduced into the line through the lubricator on the filler joint.

Gas at main line pressure was turned into the line, forcing the steel cuttings along the interior. This was continued long enough to blow out all accumulation along with the steel cuttings.

The pressure was shut off at the main line while repairmen removed the blow-off and lubricating joints from the main line. They reinstalled the original joint cut from the line and moved to the next section.

This method of line cleaning was conducted under the supervision of R. Vandercook, pipe line superintendent, and Luther Tolbert, assistant pipe line superintendent, Lone Star Gas Company; E. K. Smith, foreman of the Ranger pipe line district, and C. E. Wheat, pipe line cleaner and inspector for the Ranger district.

Commenting on the cleaning method, which is not new but which was used by the Lone Star Gas Company for the first time, Mr. Wheat said, "The interior walls of the pipe looked similar to the outside of a joint of pipe after it has been through a cleaning machine."

"The interior walls of the pipe looked as if they had been sand blasted," said Mr. Tolbert.

Lower Fuel Costs

Less Pumping

Less Storage Capacity

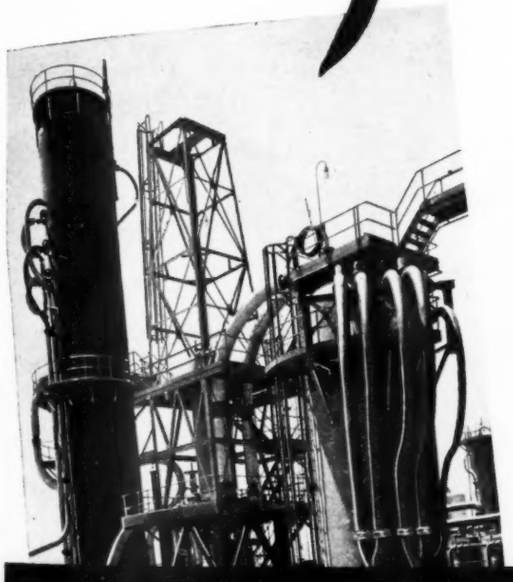
Less Tank Bottoms

THESE BENEFITS Accrue DIRECTLY TO THE Refinery

The largest increase in operating costs resulting from emulsified water in crude oil occurs in the refinery. The same factors that contribute to higher transportation costs are encountered—increased fluid volume; a more viscous crude; and bottom settlings. Still and condenser capacities are materially reduced; still and condenser corrosion increased; and more fuel is required for evaporation.

Petreco Electromatic Dehydration of all emulsified crude as produced minimizes these difficulties for the refining department, assuring worthwhile reductions in operating costs, maintenance, and replacements. The savings are clearly reflected in the monthly earnings of even the smallest refinery. In addition, closer control of products are possible, assuring higher quality.

The complete facilities of the Petreco engineering, laboratory and field departments are at your service for determining the specific advantages available to you through Petreco Electromatic Dehydration in the field. This valuable service entails no obligation whatever.



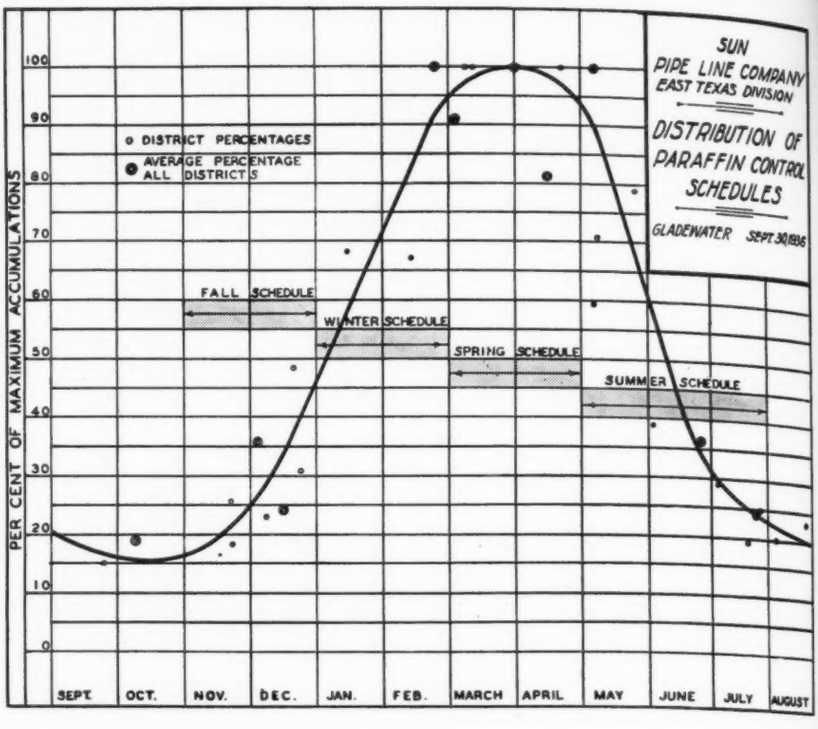
PETRECO

Electromatic

PETROLEUM RECTIFYING COMPANY
OF CALIFORNIA

General Offices: 530 West Sixth Street, Los Angeles, California
Branch Office: Houston, Texas. Branches and Service Men in Principal Oil Fields

Fig. 1



By
FRANK H. LOVE

Removal of Paraffin From East Texas Gathering Lines

Character of oil, manner of lifting, method of treating, gradient of line, and temperature are factors having a direct bearing on the volume of paraffin settling out in lines.

DURING the past year paraffin accumulations in gathering lines of the East Texas field have shown a marked increase. Fundamentally, gross deposits in gathering lines are directly proportional to the length of the line and the volume of oil passing through it over a given period of time. There are several known factors, however, that have a direct bearing on the amount of paraffin settling out in lines. These are: Character of the oil, which varies with the age of the field; the manner of lifting; method of treating; rate of flow or gradient of line; and temperature.

Character of the oil, naturally, has been changing. Crude is less alive with gas now than when the field first came in and the heavier particles and more waxey formations are being brought up from the wells, accounting to a certain degree for the increased paraffin deposits in pipe lines. This increase does not show up in the flow lines from the wells to the stock tanks, as the warm fluid passes through under pressure, but is first noticed in the necessity for cleaning more frequently the stock tanks, where the crude usually stands for several days. To offset this condition at least one major company has increased the size of the pipe line connection from 12 in. to 18 in. on a number of its lease tanks.

Salt water intrusion into the sand is general and on the increase along the entire west edge of the East Texas field, necessitating treating wells in that area. In numerous instances the emulsion is heated to approximately 140 deg. fahr. and passed through a gun barrel, where the water is dropped out. Oil so treated normally will go on the line at a temperature of 100 deg. fahr. and at that temperature virtually all paraffin is in suspension, settling out quickly when it comes in contact with the pipe line. The major increases in pipe line deposits are on leases where the crude oil thus has been heat-treated.

The accepted economical and efficient method employed throughout the field for clearing pipe lines of paraffin deposits is the regular use of line scrapers. During winter months, because of the increased viscosity of the oil, it is the practice of some companies to install small pumps at certain of the tank batteries where the gravity flow is limited to boost the crude through the line. By employing these small pumps, and increasing scraper runs, the heavier deposits of paraffin have been handled adequately.

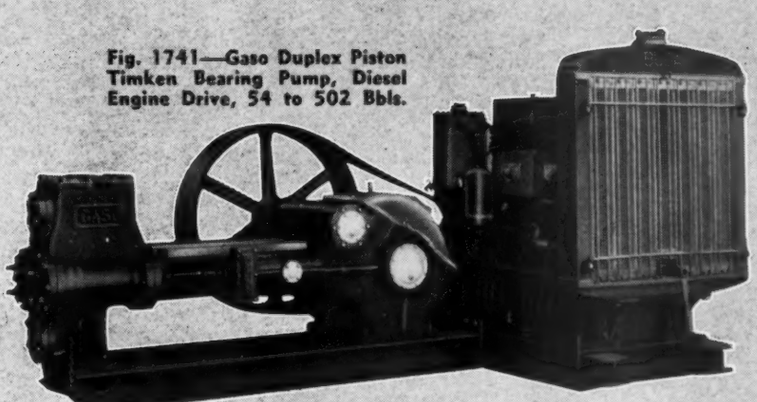
One major company, the Sun Pipe Line Company, has issued a report on its methods that is of interest because of the efficient practice it represents. Since the beginning of operations in the field this company has carried on its scraper work under predetermined schedules, with, however, occasional variations. The schedules are forecast and established theoretically, using a frequency chart prepared from empirical data, but are corrected and adjusted to local conditions by trial and error. The results of each day's work are recorded on a form prepared for this purpose. On it are shown: the line being cleaned, size of line, kind of pump, time scraper was placed in line and time taken out, and the

TEAMWORK

● A sharp liner close to second base . . . The shortstop streaks to snare the ball—but invariably, in a good team, one of his mates is behind him, ready to "back up" the play. It's *teamwork* that wins first place in the standings.

And it's teamwork, too, that gave GASO first place in the field of oil-industry pumps—a combination of executives, engineers and workmen who know the oil industry and work together in building pumps especially adapted to the exacting needs of oil-industry service. Gaso Pump & Burner Mfg. Co., Tulsa, Okla. Export Office: 149 Broadway, New York.

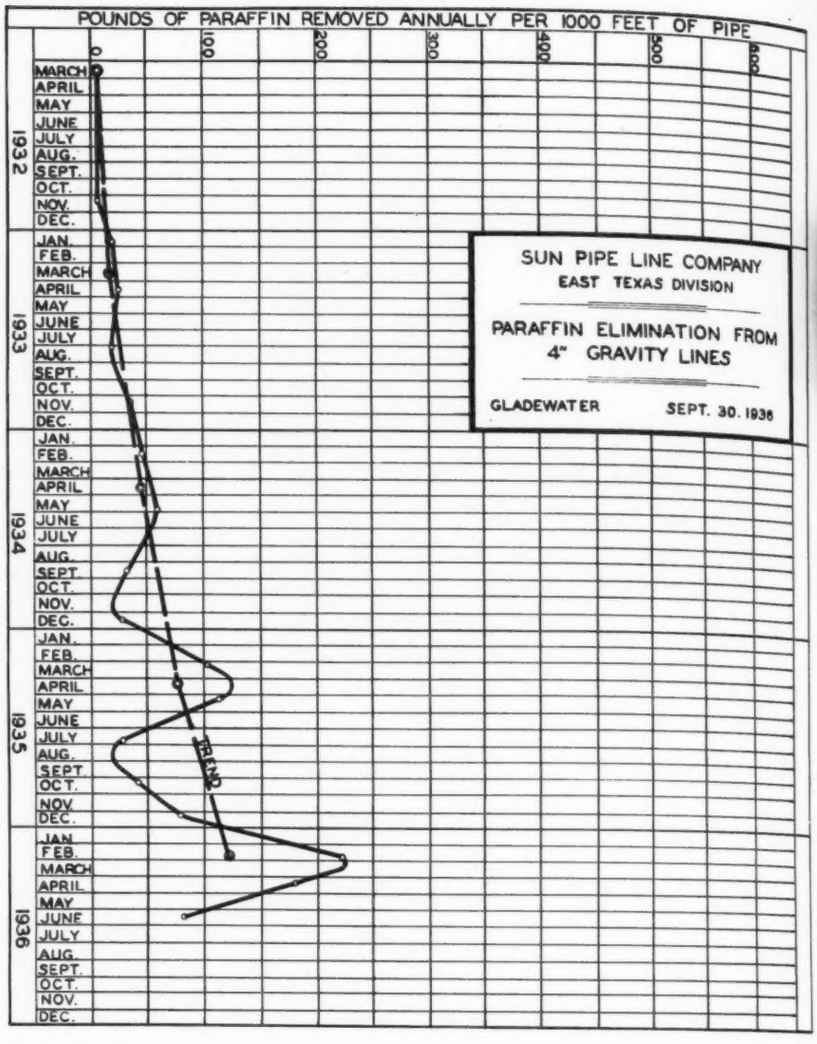
Fig. 1741—Gaso Duplex Piston Timken Bearing Pump, Diesel Engine Drive, 54 to 502 Bbls.



Complete Gaso Condensed Catalog, in 1937 Composite Catalog

GASO PUMPS
for every oil industry need

Fig. 2



volume of paraffin removed from the line. From these daily reports the permanent ledger is posted for each line through which the scraper has been run. This latter record gives the number of the line, its size, location, and length, date the run was made, whether a suction or discharge line, kind of pump, time required to make the run, and volume of paraffin removed. A place is provided on the sheet for "remarks" where notations can be made of any special factors connected with the work. A study of this sheet, on which is recorded the result of each scraper run through this particular line since the beginning, will disclose certain characteristics and regularity in the amount of paraffin accumulated. The volume of paraffin removed from the line depends to some extent upon local conditions and, as a ledger sheet is maintained for each gathering line, the results from all 4-in. lines have been averaged for use in making analyses, 4-in. lines being selected for all analytical work inasmuch as most of this company's system is constructed of that size pipe.

Lines having a low gradient naturally are subject to stoppage by considerably less accumulation of paraffin than a normal gravity line and must be given special attention. These lines can be kept free of paraffin without difficulty, but it is necessary to pump the scrapers through with portable pumps.

Weather conditions are a direct determining factor in the amount of paraffin that settles out in the lines, as is well known, greatest accumulations occuring during mid-winter and the lowest during the summer months. Runs for the last two years have been averaged and plotted on an accompanying chart that shows the rate of accumulation throughout the year and the schedules arranged to cover the periods of heavy deposits. (Fig. 1.)

The majority of the gravity lines have been cleaned four times annually during the last three years, and this frequency still is adequate except for a half dozen lines through which scraper runs have been increased to eight annually. These schedules have been found to insure uninterrupted service in the regular gathering of oil from the various leases and to permit scraper runs with the minimum use of portable pumping units.

During the previous year the portable pumping unit was brought into service a greater number of times than for all preceding years combined. On the winter schedule alone it was required 21 times to pump scrapers through gravity lines, and 14 times to pump out sluggish lease tanks into the gravity system.

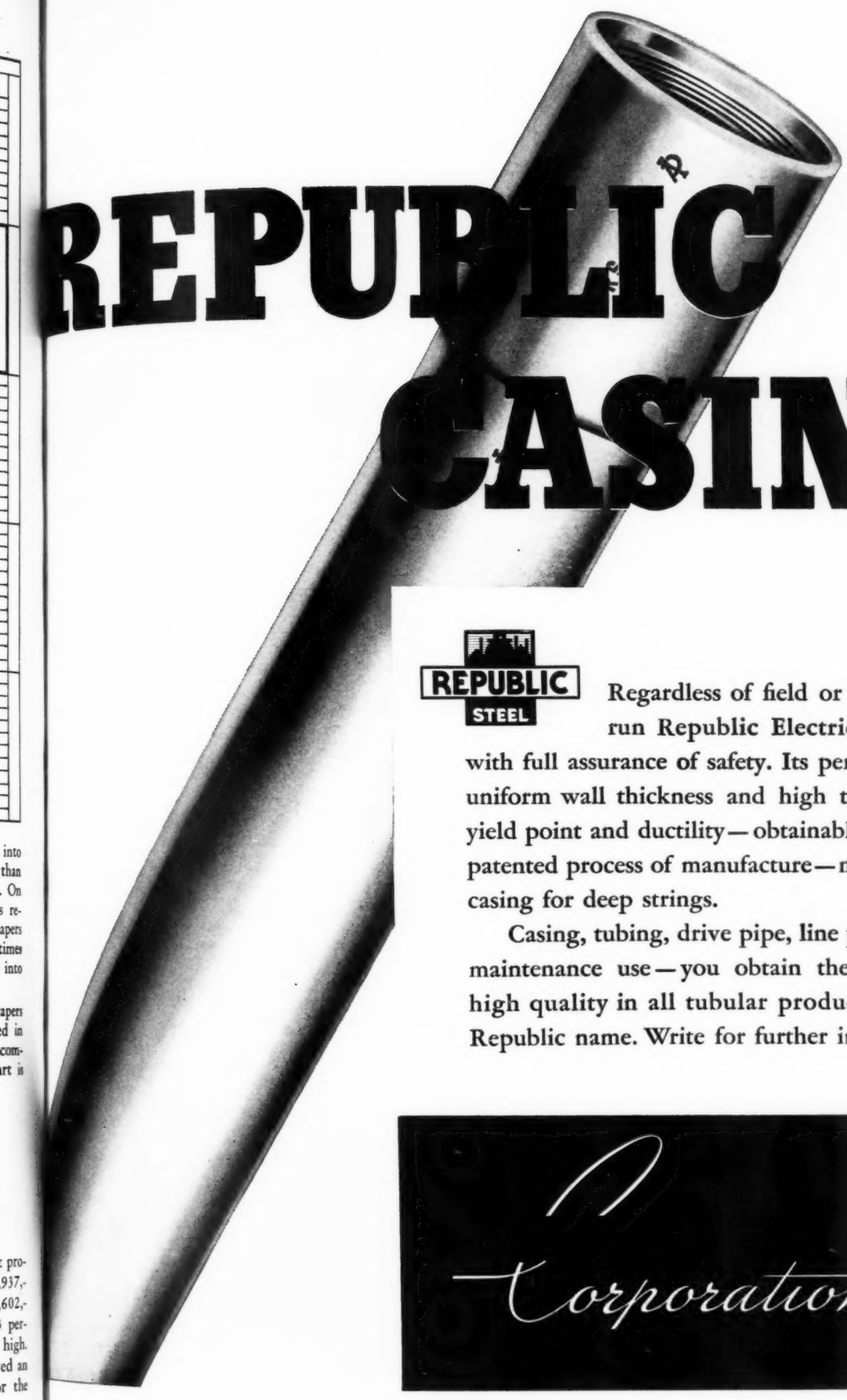
Results obtained from use of scrapers since the system was first placed in operation are charted on the accompanying graph, Fig. 2. This chart is self-explanatory.

Fuel-Generated Electric Power Made Big Gain Last Year

PETROLEUM fuels and natural gas produced 13,860,000,000 kw. of electricity in 1936, or 19 percent of the total electric output generated other than by water-power, reports the Federal Power Commission. Fuel oil consumption was 14,119,000 bbl., an increase of 24 percent over 1935. Natural gas consumption was 156,080,000,000 cu. ft., an increase of 24.6 over the previous year.

Use of coal for generation of electricity also gained, with a total consumption last year of 42,025,000 tons, an increase of 20.7 percent over 1935.

Fuel-generated electricity last year was 72,188,000,000 kw., and that produced by water-power was 40,937,000,000 kw., or a total of 113,602,000,000 kw., an increase of 14.3 percent over 1935 and an all-time high. Water-generated electricity showed an increase of only 2.4 percent for the year.



REPUBLIC CASING

REPUBLIC STEEL

Regardless of field or depth, you can run Republic Electric Weld Casing with full assurance of safety. Its perfect roundness, uniform wall thickness and high tensile strength, yield point and ductility—obtainable by Republic's patented process of manufacture—make it the ideal casing for deep strings.

Casing, tubing, drive pipe, line pipe or pipe for maintenance use—you obtain the same uniform high quality in all tubular products bearing the Republic name. Write for further information.

Corporation

Input well on Carter lease in South Burbank pressure maintenance properties. It is similar to a producing well except that no tubing is used for gas injection

By

J. C. ALBRIGHT

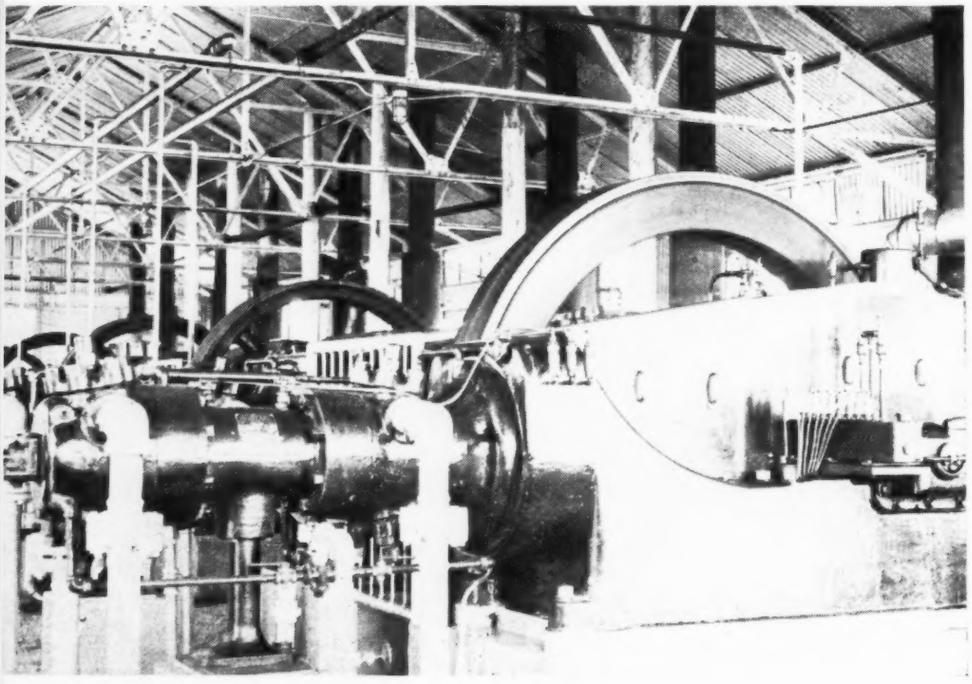
Pressure Maintenance Operations in the South Burbank Pool

Maintenance of reservoir pressure has been the important feature of program under the set-up effected in June, 1935, after pool had been partially developed

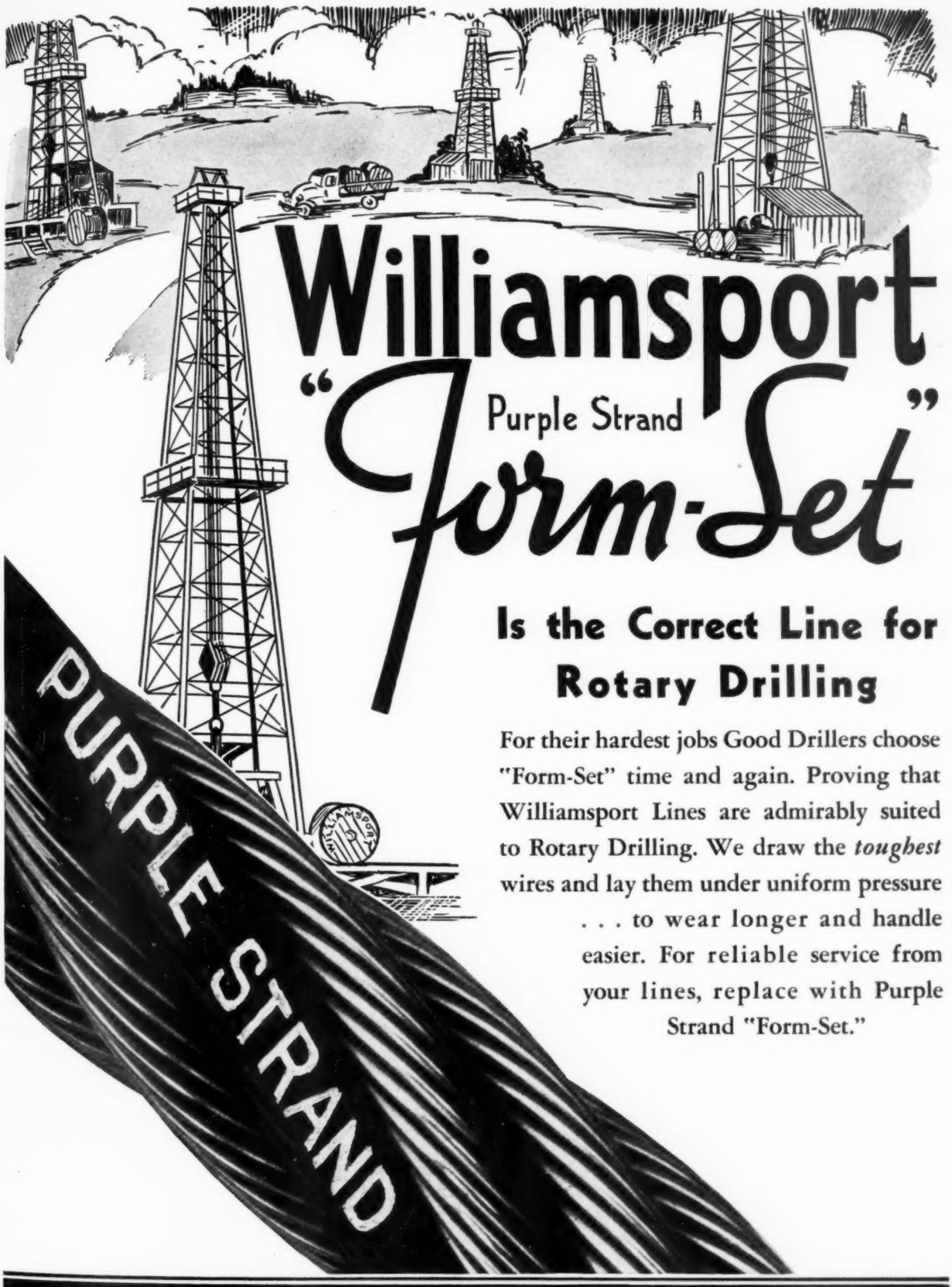
WHEN Mead Production Company, et al., brought in their No. 1 L. Denoya in the NE-NE-SW ¼ Sec. 10, Range 6 east, Township 25 north Osage County, Oklahoma, on December 28, 1933, production was obtained that resulted in the discovery of the South Burbank pool. June 1, 1935, a large number of lease owners in that area agreed to form a community block for unit operation of wells. Carter Oil Company, which had the greatest number of acres in the area, was selected as the operating company. This company drills the wells, maintains the engineering corps, and attends to the pressure maintenance of the producing formation.

When the community block was organized, plans were made immediately to return as large a portion as possible of the produced gas back to the reservoir, utilizing for this purpose a compressor station originally constructed by Carter as a compression gasoline plant. Several companies have producing properties in the South Burbank pool that are not included in the unit plan of operation; nevertheless such properties are under pressure maintenance and operated accordingly. The companies outside the unit have approximately 35 percent of the field's production, and the unit, known as Community No. 42, has about 65 percent.

As South Burbank was the first field to begin a program of pressure maintenance in Oklahoma, surveys were begun at the outset to determine the areas of greatest gas/oil production so the gas cap could be outlined. The areas of highest gas/oil production indicated that the gas cap, such as it was found



Engine room of Unit operation compressor plant in South Burbank



Williamsport

"Purple Strand Form-Set"

Is the Correct Line for Rotary Drilling

For their hardest jobs Good Drillers choose "Form-Set" time and again. Proving that Williamsport Lines are admirably suited to Rotary Drilling. We draw the *toughest* wires and lay them under uniform pressure . . . to wear longer and handle easier. For reliable service from your lines, replace with Purple Strand "Form-Set."

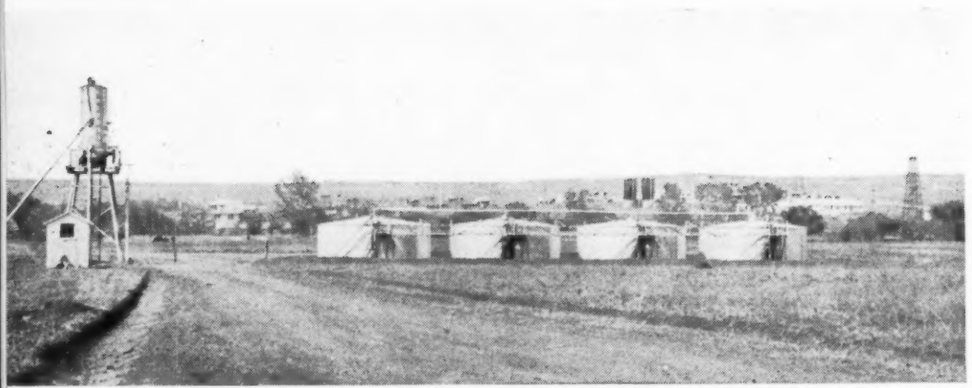
WILLIAMSPORT WIRE ROPE CO.

Williamsport, Pennsylvania — 122 South Michigan Avenue, Chicago, Illinois

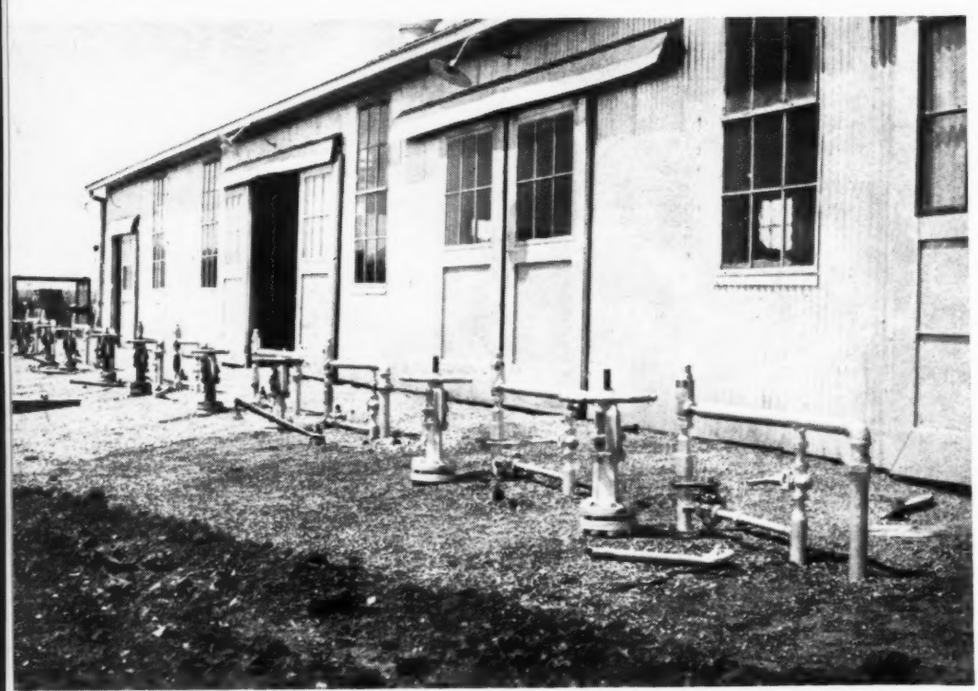
OTHER OFFICES IN ALL PRINCIPAL CITIES

Oil Country Sales Offices: Williamsport Bldg., Fourth and Midland Valley Tracks, Tulsa, Oklahoma; 10 North Milby Street, Houston, Texas

Distributors in Texas, Louisiana and Arkansas: Mid-Continent Supply Company.
General Machine and Tool Company, Distributors in Kansas.
American Pipe and Supply Company, Distributors in the Rocky Mountain Territory.



Looking across creek bottom from the south toward Unit camp in South Burbank pool. Note arrangement of flow tanks and secondary oil and gas separator



Row of high-pressure gate valves on compressor inlet and discharge lines of plant on South Burbank Unit operated block

to be, was spread irregularly over the properties, running in a southwest-northeast direction, with almost a north-south trend. The irregularity of the gas cap was caused, presumably, by the extreme flatness of the structure, which did not permit as great a concentration of gas in any one area as would have occurred had the flanks of the structure dipped more steeply.

Some of the input wells were converted from original producers, others were drilled expressly for the purpose. Wells drilled for input purposes were completed in the same manner as those drilled for oil producers, using approximately 40 ft. of 12½-in. surface pipe. Three additional strings are used in the field, the first being 10¾-in., ordinarily landed at about 1250 ft., and followed by approximately 2550 ft. of 8⅝-in. casing. The oil string of 7-in. casing is set at an average depth of 2700 ft., and cemented with about 75 sacks of cement. The oil string in the input wells is used as a flow line for injecting the gas, as no tubing is utilized to convey the gas from the surface connections to the sand below the cemented shoe of the last string of pipe. The input wells and their location are as follows:

No. 10, Mead DeNoya, SE-NE-SW 10-6-25.

No. 8, Carter Presbury, SW-NE-NE 10-6-25.

No. 7, Carter DuCoty, NE-SW-SE 3-6-25.

No. 3, McKinley, NE-SW-SW 35-6-26.

No. 5, Enterprise, NE-SE-SE 34-6-26.

No. 7, Enterprise, NW-SW-SW 35-6-26.

No. 3, Carter Munza, NE-SW-NW 2-6-25.

No. 2, Carter Stanley, SW-SW-SW 2-6-25.

Wells utilized by outside producers for repressuring the sand are located as follows:

Champlin, Fletcher No. 4, NE-SE-SE 4-25-6.

Sinclair, No. 7, NE-SW-SE 9-25-6.

Kewanee, Hale No. 5, NE-NE-SE 27-26-6.

Skelly, Smith No. 8, NW-SE-NW 27-26-6.

Lewis, Calahan No. 9, NE-NW-SW 23-26-6.

Physical equipment employed to inject the residue gas back into the producing sand through the several input wells is similar to that used in other projects where pressure-maintenance practice is followed. The original compression gasoline plant was equipped with four twin gas engine-driven compressors with 16-in. power cylinders. When the plant was converted to a pressure maintenance unit all engines were equipped with 17-in. power cylinders and gas-injection heads. Three additional units were installed later, making seven in all, giving the plant a combined rating of 1645 horsepower.

Gas to the intake of the compressor cylinders is obtained from the discharge lines leading from two of Skelly Oil Company's gasoline plants, and is received by the input compressors at a pressure of approximately 275 lb. gauge. Using compressor cylinders with a bore of 6 in., the pressure of the gas is boosted to a discharge pressure of approximately 1000-lb. gauge.

The gas produced and handled in the field is metered at many different points: at the intake of the gasoline plant gathering lines, at the vent lines from the well traps when it is necessary to blow gas to the air for any reason, at the gasoline plant intake header, on the residue gas outlets from the plants, and on each input well. In this manner an accurate accounting can be had of every cu. ft. of gas produced from the wells and the volume consumed for fuel on the leases.

The percentage of gas returned to the sand is maintained as great as possible. During February, 1937, 85 percent of the gas produced from the unit property was returned to the reservoir. High pressures have been held on the producing sand as a result of this practice, and the drop in reservoir pressure has been relatively small. The average bottom-hole pressure for the pool in November, 1936, the last reading taken, was 723 lb. per sq. inch.

ASK THE CEMENTERS

ON SOUTHERN MINERALS BLISS No. 6

ON Southern Minerals' Bliss No. 6, Clarkwood, Texas—oil string, 4800 ft. of 7" casing, 9⅝" hole—the Superintendent ran slurries up to 15.4 lbs. 'Incor' gave him exactly what he needed—for 'Incor' pumps readily at 15 or 16 lbs., assuring a stronger, denser, longer-life shut-off.

Even at 16 lbs., 'Incor' is free-flowing, velvet-smooth—and it stays gel-like to keep out mud. For 'Incor' is specially made to do just that.

And controlled setting time, built into the cement itself, allows plenty of leeway when delays occur while running cement into place. Dependable high early strength permits drilling out in 1 to 2 days.

Two Oil-Well Cements

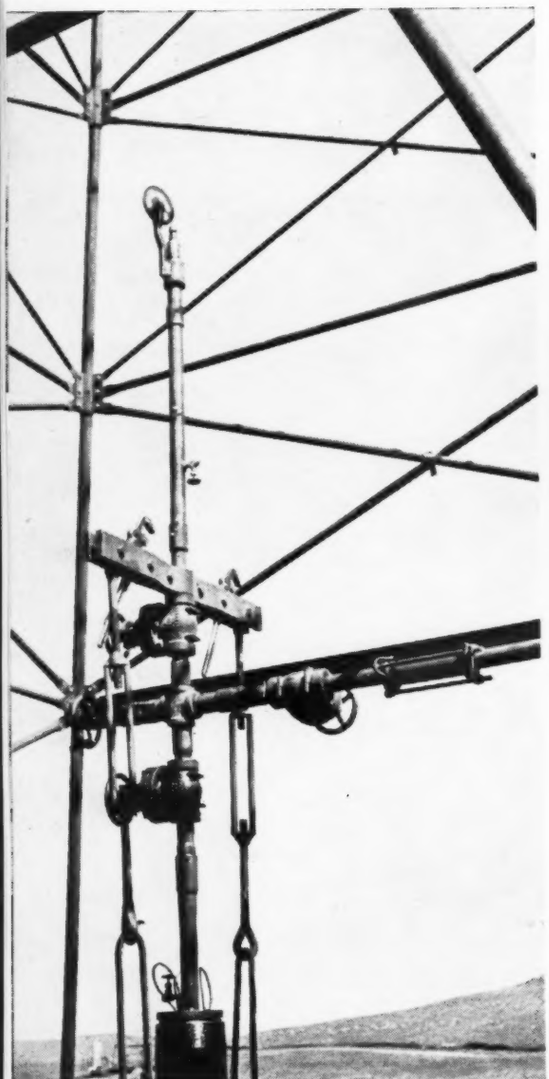
'Starcor,' too, has these needed special properties, only it is 'timed' for use in deep, hot holes. And 'Starcor' is also specially processed for use where sulphate waters tend to destroy the action of ordinary cement.

Use 'Incor'* or 'Starcor'* next time, depending on the job. You'll find it pays—and pays well. Made and sold by Lone Star Cement Corporation, Dallas—Houston.

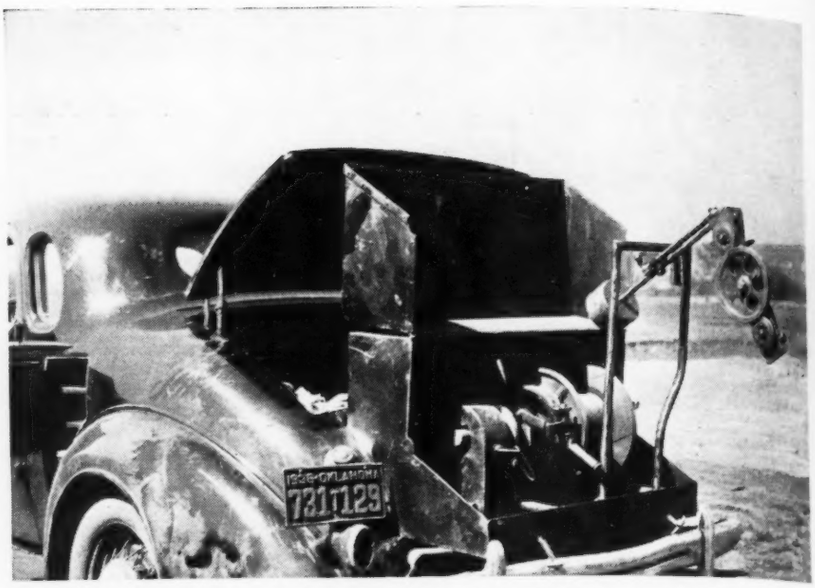
*Reg. U. S. Pat. Off.

TWO PORTLAND CEMENTS—BOTH MADE FOR OIL WELLS

Properties	'Incor'	'Starcor'
Greater pumpability	Free pumping at 15 to 16 lbs.	
Gel-like body	Reduces mud contamination; doesn't settle out	
Controlled setting time	Normal UNDER 140°	Normal OVER 140°
High early strength	Drill out 1 to 2 days	Drill out 2 to 3 days
Sulphate-water resistance	Good	Exceptional sulphate resistance



Gate valves on Christmas tree. A pressure bomb on a Halliburton measuring line just entering lubricator for bottom-hole pressure test

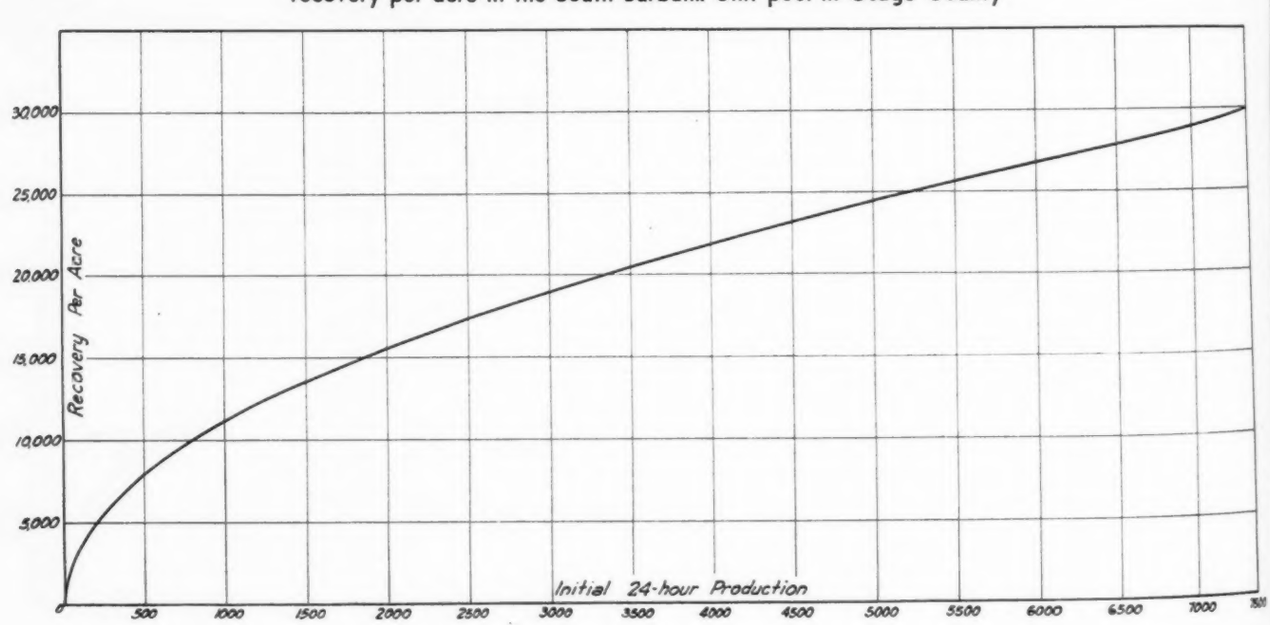


Halliburton measuring device used by Carter Oil Company when taking bottom-hole tests in South Burbank Unit pool

For the month of February, 1937, records show that 538,165,000 cu. ft. of gas was produced from the wells, of which amount 455,747,000 cu. ft., or 85 percent, was returned to the sand. The produced gas/oil ratio for February, 1937, was 1955 cu. ft., and, according to the records kept on the property, the injected gas/oil ratio was 1655 cu. ft., leaving a net produced gas/oil ratio of 300 cu. ft. per barrel.

A total of 9,290,827 bbl. of oil had been produced at the end of February, together with 9,967,331,000 cu. ft. of gas, an overall gas/oil ratio of 1072 cu. ft. per barrel. A total of 5,386,286,000 cu. ft. of gas had been returned to the sand by the unit, showing that 54 percent had been used for injection purposes. The produced gas/oil ratio was reduced because of the large volume of gas returned to the sand to a net produced gas/oil ratio of 300 cu. ft. per bbl. for February, 1937, and for the entire period since the field was dis-

Square root relationship curve based upon production figures in old Burbank pool, which is used in determining the recovery per acre in the South Burbank Unit pool in Osage County



YOUNGSTOWN

..make good on tough jobs

★Giant pinion gears which stand up under the gruelling punishment of propelling mammoth tractors....rotary drill-bits which probe for oil through thousands of feet of subterranean rock ....gears for great motor-trucks which must survive the grind of almost constant travel....these are just a few of the duties for which experienced buyers select YOUNGSTOWN Alloy Steels.

★In the brief space of three years Youngstown's Alloy Steel Department has established an outstanding reputation for completely dependable quality.

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices-YOUNGSTOWN, OHIO
Alloy Steel Headquarters - - - Chicago, Illinois

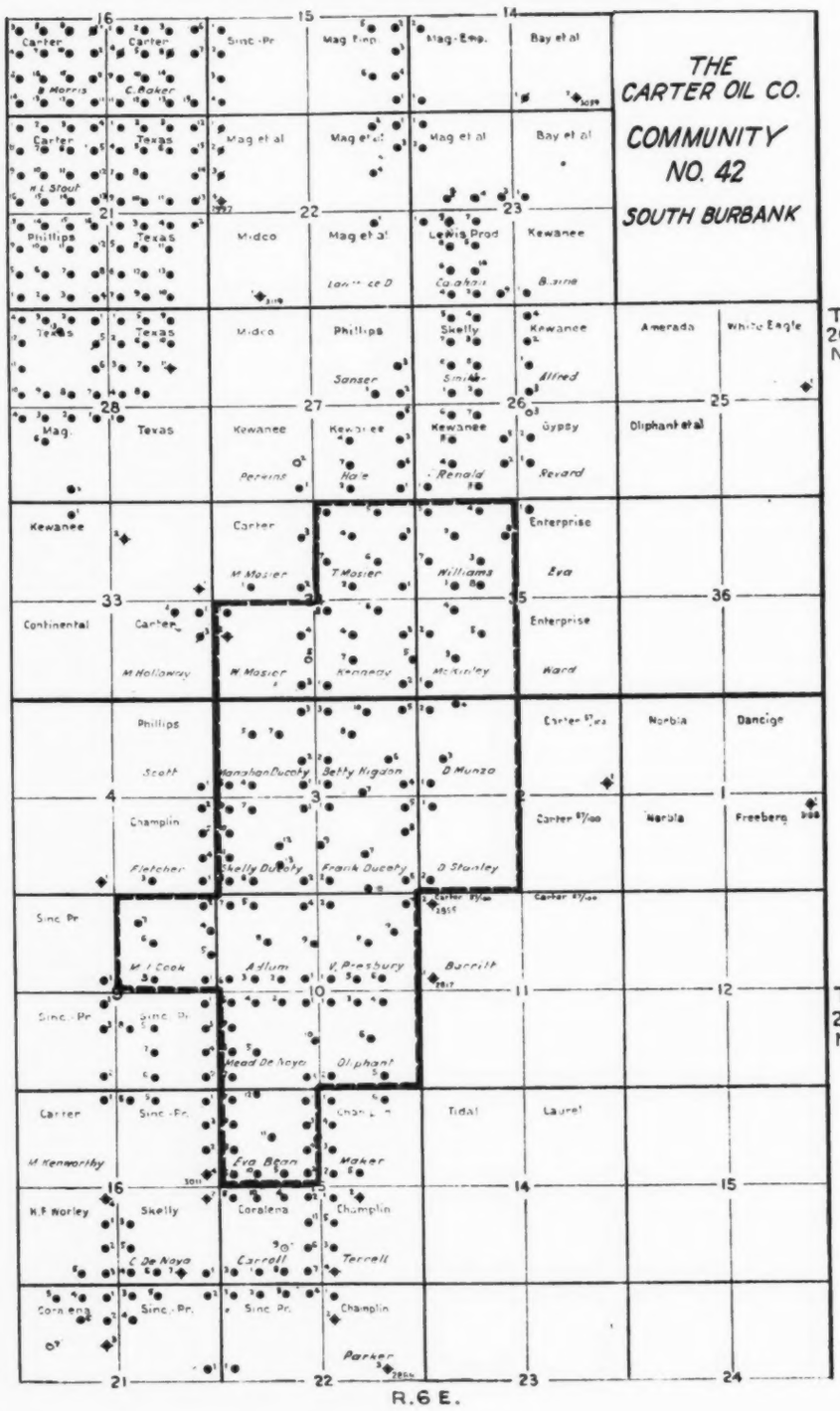
covered, the net produced gas/oil ratio is 481 cu. ft. per barrel.

It has been estimated that approximately 30,000,000 bbl. of oil was available at the time the unit was formed, within the unit area for normal primary production, but with pressure maintenance carried on to the conclusion of the field, at least an additional 20 percent may be expected. The total productive acres in the unit are roughly 2250, upon which 115 oil wells have been drilled, making an average spacing of 19.5 acres per well.

The unit is unique in that it was unitized after the pool was partially developed, thereby necessitating estimation of the reserves under each of the tracts that were to come into the unit. As all the wells were drilled with cable tools, practically no core data were available; so the method of estimating reserves by porosity could not be utilized. Sand conditions of the South Burbank pool are quite similar to those of the Old Burbank pool, it finally was agreed by operators that the estimation of reserves for the South Burbank pool would be based on the recovery that would be obtained in the Old Burbank pool. A study of data on the Old Burbank pool, revealed a definite relationship between initial production and ultimate recovery, the recovery per acre being proportionate to the square root of the initial production. It was decided, therefore, to apply this relationship to the South Burbank pool to determine the recoverable reserves under each tract if it were not produced under pressure maintenance. This was done by preparing an iso-potential map, and, by means of a planimeter, arriving at the weighted average initial production of each 160-acre tract, and from the square root curve obtaining the recovery per acre. The percentage participation of each tract was in the same proportion to the whole as the reserves of each tract bore to the total reserves of the acreage included in the unit. Naturally, such a task was not a simple one, and its attainment was possible only because the operators concerned were farsighted enough to realize the advantages and benefits of a unitized and efficient pressure-maintenance program, and were broad-minded enough to lay aside their minor differences of opinion in order to gain the greater goal.

The membership in the unit block, officially termed the South Burbank Community No. 42, and their percentage of participation are as follows:

The Carter Oil Company, Community No. 42, South Burbank

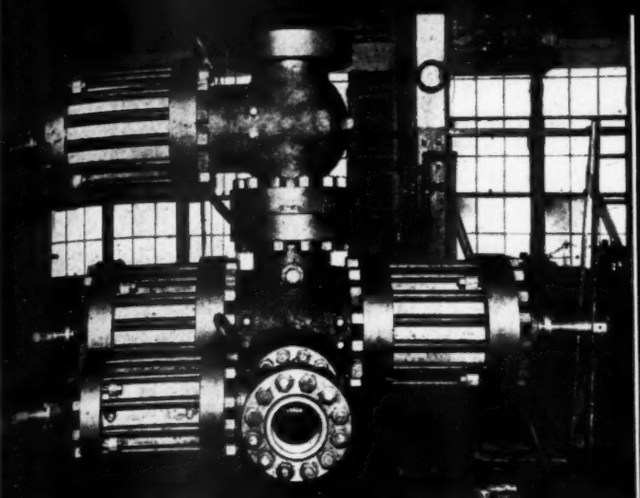


Member	*Percentage of Participation*
Albec Oil Company	3.29
Bay Oil Company	2.36
Bridgeport Machine Company	1.10
Buffalo Oil Company	2.13
Carter Oil Company	19.53
Empire Oil & Refining Co.	4.56
Enterprise Transit Co.	23.31
Gulf Oil Corporation	1.32
I. T. I. O. Co.	1.53
J. E. Mabee	1.31
Manahan Oil Company	2.13
Midco Oil Corporation	9.52
Norbla Oil Company	8.06
Phillips Petroleum Company	9.93
Skelly Oil Company	9.92
Total	100.00

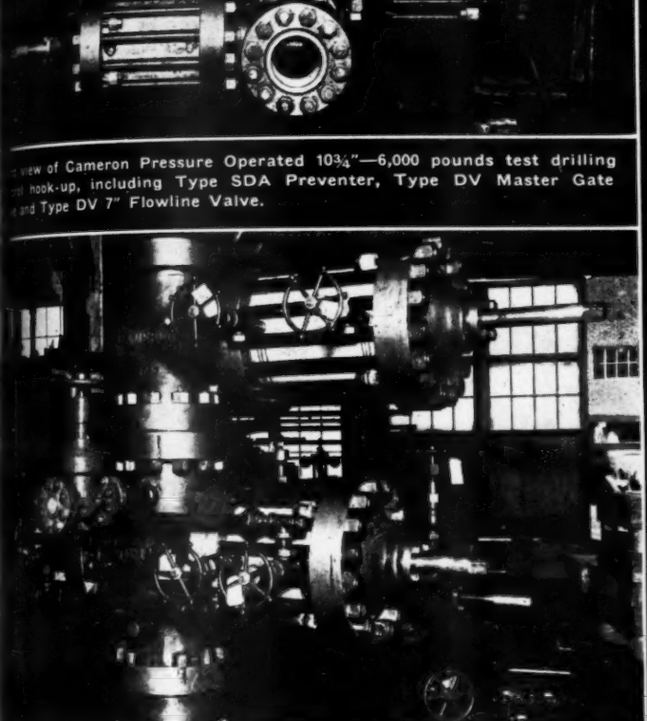
An engineering committee is as follows: F. W. Floyd, chairman, Carter Oil Company; M. L. Haider, acting chairman, Carter Oil Company; K. E. Beall, Phillips Petroleum Company; C. C. Rae, Skelly Oil Company; Alfred Beck, Albec Oil Company; F. M. Jacobson, Buffalo Oil Company.

Field operations are in charge of Ivan S. Salnikov, superintendent.

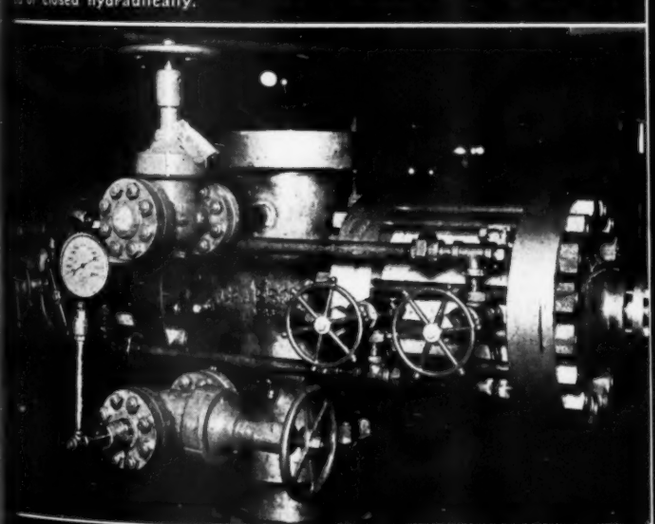
6000 lbs. test



view of Cameron Pressure Operated 10¾"—6,000 pounds test drilling
ol hook-up, including Type SDA Preventer, Type DV Master Gate
and Type DV 7" Flowline Valve.



view of drilling control hook-up shown above, illustrating individual
-6,000 pounds test angle valves used in control manifold to lock rams
ed or closed hydraulically.



remendous sealing power of Cameron Self-feeding Ram Packing Ele-
is clearly illustrated by the gauge above, which reads 7,800 pounds.
were closed around test nipple.

WELL DRILLING

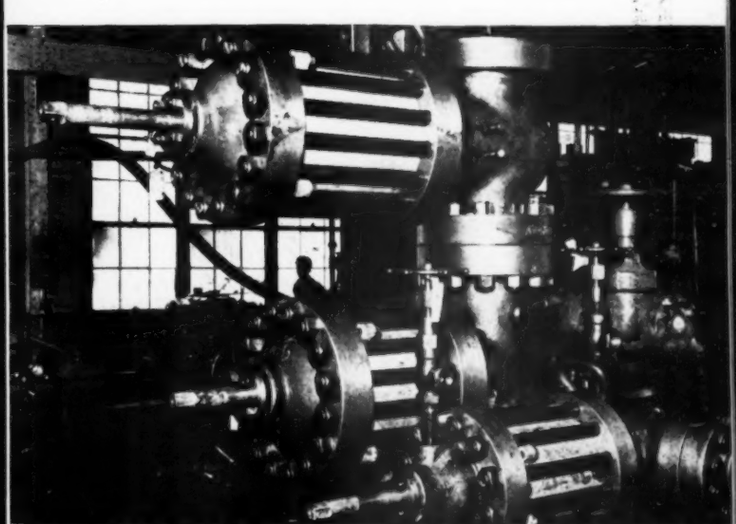
Development of unprecedented surface pressure by several deep wells drilled in the Gulf Coast area in 1936 has prompted a demand for, and the development of, a 10¾" —6,000 pounds test Cameron drilling control hook-up for use on intermediate casing strings in deep well drilling. Four views of this fast, positive and exceedingly powerful hook-up, taken on the test block in our shops, are shown herewith. This hook-up is suitable for installation on 10¾", 9⅝" or 8⅝" intermediate casing strings. It consists of a 10¾" Cameron Type SDA Blowout Preventer, a 10¾" Cameron Type DV Master Gate Valve and a 7" Cameron Type DV Flowline Valve. All units are full pressure operated and may be closed swiftly and positively against the highest well pressure.

To operators facing unknown pressures on tests below 7500 feet, full details of this hook-up will prove interesting. They will gladly be forwarded upon request.

CAMERON IRON WORKS, INC.

711 MILBY STREET HOUSTON, TEXAS

EXPORT OFFICE: 74 TRINITY PLACE, NEW YORK, N. Y.
MIDLAND: W. P. (RED) KNIGHT
CORPUS CHRISTI: J. M. (RED) TEAGUE
LOUISIANA: PELICAN WELL & TOOL SUPPLY CO.
OKLAHOMA AND KANSAS: CARSON MACHINE & SUPPLY CO.
MEXICO: J. W. ALLEN, APDO. 542, TAMPICO, TAMPS.



Front quarter view of drilling control hook-up showing how three of t
four ram and ram-gate locking screws extend parallel and in the same
rection, concentrating closing all wheels at two points outside the derr
floor.

Seventh Mid-Year Meeting

June 1, 2, and 3, to be Held at Broadmoor

Large attendance anticipated at sessions, which will be devoted largely to the exchange of technical information

PRESSING problems encountered in oil field and refinery operations, use of Diesel engines, and effective ways and means of preventing accidents, occupy prominent places on the preliminary program for the seventh mid-year meeting of the American Petroleum Institute to be held June 1, 2, and 3 in the Broadmoor Hotel at Colorado Springs, Colorado.

The meeting, which will bring together hundreds of petroleum engineers and technologists for some 50 committee meetings and eight group sessions, largely will be devoted to exchange of technical information looking to the solution of operating problems. The first day, Tuesday, June 1, will be given over to committee meetings. The Institute's divisions of production and of refining will have group sessions Wednesday and Thursday, with an informal dinner Wednesday evening. Group sessions will be resumed by the two divisions Thursday morning. On Thursday afternoon the Institute's Department of Accident Prevention will have a group session with four speakers.

The preliminary program follows:

Tuesday, June 1, committee meetings.

Wednesday, June 2, 10:00 a. m.: Division of Production group session on allocation and production problems, in Ballroom, mezzanine floor, sponsored by the Central Committee on Drilling and Production Practice. Papers on the following subjects are being considered by the Program Committee for presentation: "Application of Phase-Equilibrium Data to the Estimation of Oil and Gas Reserves," "Proration of Allowable Oil Production," "A Witness's Duties and Rights," and "Results of Tests on Solubility, Critical Flow Rates, Decline Characteristics, Forecast of Gas-Oil Ratio, etc."

10:00 a. m.: Division of Refining group session on refinery problems, in Little Theatre, ground floor, with the following papers to be presented: "Gasoline Blending with a Ratio Flow Controller," John W. Brown and F. M. Jones, Continental Oil Company, Baltimore, Maryland; "Storage of Volatile Fractions of Gasoline," W. B. Franklin, Humble Oil and Refining Company, Baytown, Texas; "Refinements in Sweetening Technique," J. A. Altshuler and F. G. Graves, Stratford Engineering Corporation, Kansas City, Missouri; "Effect of Sweetening on Properties of Gasoline," G. G. Oberfell, Phillips Petroleum Company, Bartlesville, Oklahoma; and "Crude Oil Dehydrating and De-Salting," J. J. Allinson, Lion Oil Refining Company, El Dorado, Arkansas.

10:00 a. m.: Meeting of Institute's Board of Directors, mezzanine floor, Palm Court.

2:00 p. m.: Division of Production group session on drilling practice, in Ballroom, mezzanine floor, sponsored by Central Committee on Drilling and Production Practice. Papers on the following subjects are being considered by the Program Committee for presentation: "Cause and Cure of Stuck Drill Pipe, Casing, and Tubing," "Standard Practice for Handling Rotary-Drilling Mud," "Importance of Heat Treatment and Design," and "Vibration Problems in Oil Wells."

2:00 p. m.: Division of Refining group session on refinery problems, in Little Theatre, ground floor, with following papers to be presented:

"Recent Developments in Use of Contact Clays," S. R. Funsten, Filtrol Corporation, Philadelphia, Pennsylvania; "Solvent Refining from Point of View of Operator," V. A. Kalichevsky, T. P. Simpson, and B. W. Story, Socony-Vacuum Oil Company, Inc., Paulsboro, New Jersey; "High-Octane-Number Blending Stocks Produced by Solvent Extraction," E. Saegebarth, A. J. Broggini, and E. Steffen, Edeleanu Company, Ltd., New York, New York; and "Experimental Solvent-Extraction Tower Unit," Herschel G. Smith, Gulf Oil Corporation, Philadelphia.

7:00 p. m.: Informal dinner in dining room, mezzanine floor.

Thursday, June 3, 10:00 a. m.: Division of Production group session on oil-country tubular goods, in Ballroom, mezzanine floor, sponsored by Central Committee on Drilling and Production Practice. Papers on the following subjects are being considered by the Program Committee for presentation: "Abuse in Handling Tubular Goods," "Thread-Measuring Instruments for Tubular Goods," and "Report on Special Tests on Casing Threads."

10:00 a. m.: Division of Refining group session on Diesel problems, in Little Theatre, ground floor, with the following papers to be presented:

"The Development of Test Procedure for the Evaluation of Diesel Lubricating Oil," C. G. A. Rosen, Caterpillar Tractor Company, San Leandro, California; and "Diesel-Engine Lubricating Problems," G. C. Wilson, University of Wisconsin, Madison, Wisconsin.

2:00 p. m.: Division of Production group session on production practice, in Ballroom, mezzanine floor, sponsored by Central Committee on Drilling and Production Practice. Papers on the following subjects are being considered by the Program Committee for presentation: "Present-Day Practice on Control Devices for Production Service," "Methods of Calculating Plunger Strokes in Sucker-Rod Pumps," "How to Pump Crooked Holes," and "Chemical Clean-Out of Oil Wells in California."

2:00 p. m.: Department of Accident Prevention group session on accident-prevention problems, in Little Theatre, ground floor, with the following papers to be presented:

"Development and Use of Accident-Prevention Manuals," G. O. Lockwood,

American Petroleum Institute, Hotel, Colorado Springs, Colorado

Empire Companies, Bartlesville, Oklahoma; "Transporting Gasoline by Trucks," J. F. Winchester, Standard Oil Company of New Jersey, New York, New York; "Preventing Rotary-Drilling Accidents," J. B. Roaper, Humble Oil and Refining Company, Houston, Texas; and "The Value of Accident Statistics," H. N. Blakeslee, American Petroleum Institute, New York, New York.

Committee Meetings

Meetings of 48 divisional committees and of the Board of Directors tentatively have been scheduled. The committees, representing the Institute's Divisions of Production and Refining, will consider technical subjects related to equipment and methods utilized in the petroleum industry. Following is a tentative list of committee meetings:

Division of Production: Engineers' Sub-committee on Boilers (tentative), chairman, J. L. Glennon; Committee on Standardization of Oil Field Boilers (tentative), chairman, L. W. Voorhees; Steel Derrick Manufacturers' Sub-committee, chairman, C. R. Athy, secretary, C. L. Henry; Rig Iron Manufacturers' Sub-committee, chairman, William Schwemlein; Engineers' Sub-committee on Rigs and Derricks, chairman, C. A. Dunlop; Committee on Standardization of Standard Rigs and Derricks, chairman, W. H. Meier, secretary, C. A. Dunlop; Pipe Manufacturers' Sub-committee (tentative), chairman, J. Jay Dunn.

Engineers' Sub-committee on Pipe, chairman, C. W. Froome; Main Sub-committee on Standardization of Valves and Fittings (tentative), chairman, A. D. Sanderson; Group 2, Sub-committee on Production Valves and Fittings (tentative), chairman, E. Stanley Durward; Committee on Standardization of Oil Country Tubular Goods, chairman, John R. Suman, secretary, Melbert Schwarz; Manufacturers' Sub-committee on Rotary Drilling Equipment, chairman, J. M. Shimer; Engineers' Sub-Committee on Rotary Drilling Equipment, chairman, Hu M. Harris; Committee on Standardization of Rotary Drilling Equipment (tentative), chairman, E. J. Nicklos, secretary, Hu M. Harris.

Engineers' Sub-committee on Wire Rope and Manila Cordage (tentative), chairman, K. N. Saatjian; Wire Rope Manufacturers' Sub-committee (tentative), chairman, H. J. Leschen; Committee on Standardization of Wire Rope and Manila Cordage (tentative), chairman, C. C. Scharpenberg, secretary, K. N. Saatjian; Sucker Rod Manufacturers' Sub-committee, chairman, D. R. Dale; Pump Manufacturers' Sub-committee, chairman, E. E. Stevenson; Committee on Standardization of Pumping Equipment and Engines, chairman, T. E. Swigart; Engineers' Sub-committee on Tanks, acting chairman, C. C. Ashley.

Committee on Standardization of Steel Tanks for Oil Storage (tentative), acting chairman, C. C. Ashley, secretary, Fritz Karge; Central Committee on Standardization of Oil Field Equipment, chairman, J. Edgar Pew, secretary, C. A. Young; Program Committee (of the Central Committee on Drilling and Production Practice), chairman, J. T. Hayward, secretary, C. A. Young; Special Study Committee on Well Spacing, chairman, M. Albertson.

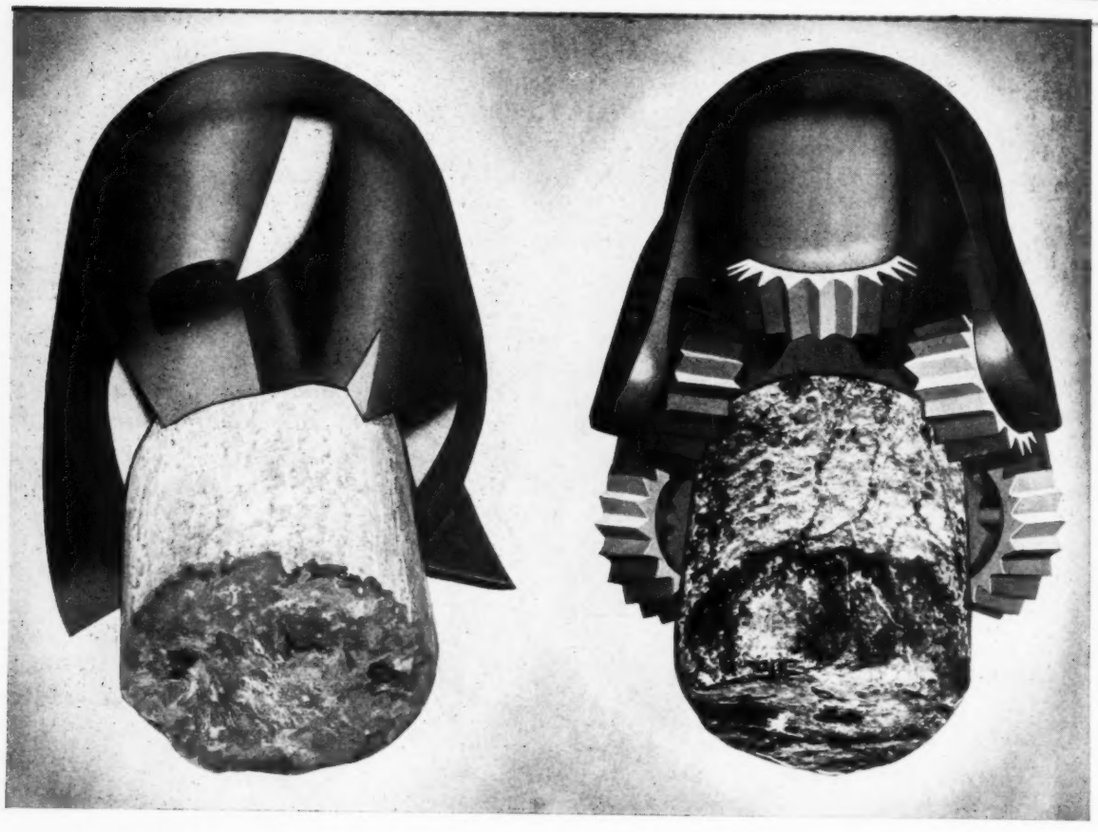
A.P.I. Board of Directors Committee on Well Spacing, chairman, George A. Hill, Jr.; Topical Committee on Drilling Practice, chairman, C. E. Reistle, Jr.; Topical Committee on Production Practice, chairman, W. E. Gilbert; Topical Committee on Production Technology, chairman, H. H. Power; Topical Committee on Materials, chairman, C. W. Froome; Special Sub-committee on Corrosion Fatigue of Drill Pipe (of the Topical Committee on Materials) (tentative), chairman, F. N. Speller; Executive Committee (of the Central Committee on Drilling and Production Practice), chairman, B. B. Wescott, secretary, C. A. Young; Central Committee on Drilling and Production Practice, chairman, B. B. Wescott, secretary, C. A. Young.

Division of Production, General Committee, chairman, George A. Hill, Jr., secretary, C. A. Young; Central Committee on Measuring, Sampling, and Testing Natural Gas and Natural Gasoline (tentative), chairman, F. E. Rice, secretary, C. A. Young; Group 1, Sub-committee on Measuring, Sampling, and Testing Natural Gasoline, chairman, S. S. Smith; Group 2, Sub-committee on Measuring, Sampling, and Testing Natural Gas (tentative), chairman, George P. Bunn.

Division of Refining: Automotive Survey Committee, chairman, E. W. Isom, secretary, R. P. Anderson; Committee on Testing Methods of Specifications, chairman, K. G. Mackenzie, secretary, R. P. Anderson; Committee on Standardization of Refinery Equipment, chairman, Arthur E. Pew, Jr., secretary, R. P. Anderson; Central Committee on Refinery Technology, chairman, R. E. Haylett, secretary, R. P. Anderson; Division of Refining, General Committee, chairman, W. S. S. Rodgers, secretary, R. P. Anderson; Division of Refining, Program Committee (luncheon), chairman, J. B. Rather, secretary, R. P. Anderson; Committee on Disposal of Refinery Wastes, chairman, John S. Hess, secretary, D. V. Stroop; Committee on Corrosion of Refinery Equipment, chairman, Walter Samans, secretary D. V. Stroop.

Other Committees: Board of Directors; Central Power Committee, chairman, O. D. Donnell, secretary, D. V. Stroop; meeting of chairmen and vice-chairmen (of the Committee on Uniform Methods of Oil Accounting), chairman, F. S. Reitzel,

The New REED



REED
INNER
BARREL
ELEVATOR

LICENSED
under Pat. No.
1,967,517
with approval of
Byron-Jackson
Company

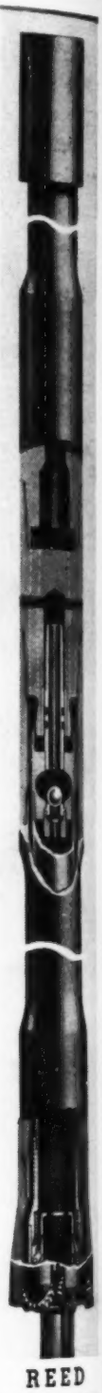
The REED KOR-KING

HAS MET WITH EQUAL SUCCESS IN CORING DEPTHS FROM THE SURFACE

LOCATING GOVERNMENT DAMSITE ON RED RIVER

TO

12,000 FEET



REED
KOR-KING
OUTSIDE VENT
TYPE

Kor-King
CORE DRILL

EMBODIES ALL THE BETTER FEATURES OF PREVIOUS CORE DRILLS . . . PLUS . . . SEVERAL EXCLUSIVE FEATURES: . . . . .

SIMPLICITY: Full floating inner barrel without complicated bearings, adjustments, or frequent replacements of parts.

•

Improved rust proof toggle and finger core catcher, which will shear the hardest rock, or hold the softest sand . . . made in one-piece to eliminate assembly on the derrick floor.

•

INNER BARREL ELEVATOR . . . for ease of handling during core extraction.

•

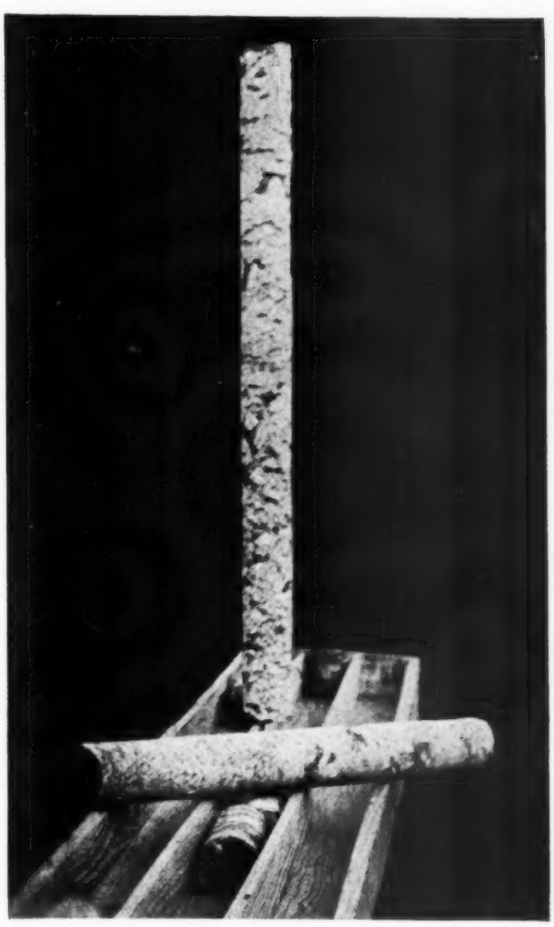
Hard formation cutter heads from 7⅝" up, have roller bearings . . . from 7⅝" down, stellite anti-friction bearings.

•

A choice of . . . outside vent . . . inside vent . . . or drop ball types . . . incorporated in the one barrel.

•

LARGER DIAMETER CORES THAN HERETOFORE OBTAINABLE



A few representative samples of the LONG, LARGE DIAMETER CORES that are being taken with the REED KOR-KING.

REED ROLLER BIT COMPANY

LOS ANGELES OKLAHOMA CITY HOUSTON NEW YORK

Mid-Continent, Rocky Mountain and Gulf Coast Distributors for MARTIN DECKER Products

Use of Wire-Line Core Barrels in California[1]

By W. A. CLARK
The Texas Company
Los Angeles, California

THE wire-line core barrel, or coring with a removable barrel, was first developed about eleven years ago. It came into general use in Mid-Continent fields by 1928. The development of full-hole drill pipe, or drill pipe in which the internal diameter is not constricted, broadened its application.

At about the same time, 1926, a wire-line core barrel was developed and used in California. There being no full-hole drill pipe, this was designed to run in ordinary drill pipe; the size being limited, it cut a core of but one inch in diameter, which was rather impractical.

Some of the first wells in California in which the barrel and bit was run were at Signal Hill and at Mountain View in 1934. At Signal Hill results with the the tool were unimpressive; recovery was but 75 percent; the heads were dulled after making only 30 to 40 feet. In comparison the conventional core barrel made considerable saving, including cost of roundtrips. At the time, it was thought that the wire-line core barrel would be uneconomical to run above 3500 feet, even though the wire-line cutting shoe could dig as fast as a drilling bit; there was the need of supplying suitable drill pipe and the rigging of a sand-reel or hoist; and, furthermore, considerable education in the use of the bit was necessary for the driller. It was very difficut to break the traditional practice of taking a core—slow revolution and plenty of weight.

Thus, in 1934, lack of standardization of wire-line hoisting equipment, a dearth of full-hole or suitable drill pipe to run the tool in; with, on the other hand, thousands of feet of good serviceable standard drill pipe on hand, and the poor showing of first tests, predicted a slow adoption of the wire-line core barrel in California. Yet, by the end of 1935, it had become rather common in use; a California company had begun the development on a competitive tool; and by the end of 1936 a total of 130,000 ft. of hole had been cored by the two companies.

[1]Paper (and accompanying discussion) presented at Spring Meeting of the Pacific Coast District A.P.I. Division of Production, Los Angeles, California, April 13, 1937.

At present the wire-line core barrels are of two types. One type has a small cutter shoe attached to the inner barrel or what would be the inner barrel of a conventional core barrel. In use it protrudes slightly beyond the main cutter shoe. This inner barrel has a catch or lock, spring-actuated, which, when the barrel is seated, locks it in place until the core is cut. It is unlocked by the pulling action of the fishing tool upon a sliding mandrel, suitably attached to the locking lug.

The second type has no small cutter shoe, but is simply an inner barrel. It is not locked but is held in place by the action of the down-pumped fluid against a packer on top of the inner tube.

Both tools have an auxiliary small cutting shoe on a suitable sinker bar to be used when drilling. Both tools are dropped into the drill pipe and pumped down to be seated. They are fished out by running a small socket inside the drill pipe on a wire line or sand line. Each can take about ten ft. of core.

Both types supply rock-heads as well as drag-heads. The following cores can be cut:

One Type:

2⅜-in. in 7⅝-in. hole and greater —Full-hole 5-in. or 4-in. Hydril drill pipe.

1⅝-in. in 7⅝-in. hole and greater; for 5-9/16-in. A.P.I. drill pipe (not recommended) and for 4½-in. full-hole.

1⅜-in. } in hole size 6½-in. or
1⅛-in. } even 5⅝-in. hole—Full hole 3-in. drill pipe.

Other Type:

2 3/16-in. core in 8½-in. hole or larger.

1⅝-in. core in 6¾-in. hole or larger.

Recoveries of course will decrease in the smaller sizes. The 2⅜-in. will show a recovery of 85 percent to 100 percent with the core in good condition.

Surface equipment has been varied. Portable truck hoists, independently powered sand-reels, sand-reels mounted on the drawworks, and sand-reels driven from the engine of the auxiliary drawworks have been used. Most rigs today have sand-reels on the main drawworks, or sand-reels set behind the twin engine on the auxiliary drawworks, and driven either from a sprocket on the jack-shaft or from one on the engine shaft. A ⅝-in. or ½-in. sand line is commonly used.

In running, the cutter shoe and outside barrel containing the inner barrel is run into the hole. After cutting the core, the fishing tool is run through the drill pipe on the wire line and the core barrel containing the core removed. This operation requires from ten minutes for shallow holes to forty minutes for holes up to 10,000 ft. in depth. The drill pipe may be rotated during the operation in case of sticky hole. In addition, a stuffing box arrangement can be provided so as to circulate occasionally during the period of pulling the line.

After pulling the small core barrel, a second tube is dropped in the drill pipe and pumped to the bottom. About one minute per thousand ft. of depth is required for the tool to reach bottom and seat. Usually fluid is pumped into the hole for some time over the minimum period to insure complete seating of the core barrel before coring (or drilling) is commenced.

The operations are repeated until the large cutter shoe is worn out. The drill pipe then, of course, is pulled. Recent records show continuous runs up to 150 ft. in several fields and in varied formations, before the drill pipe was pulled from the hole. Maximum runs of 650 ft. have been recorded.

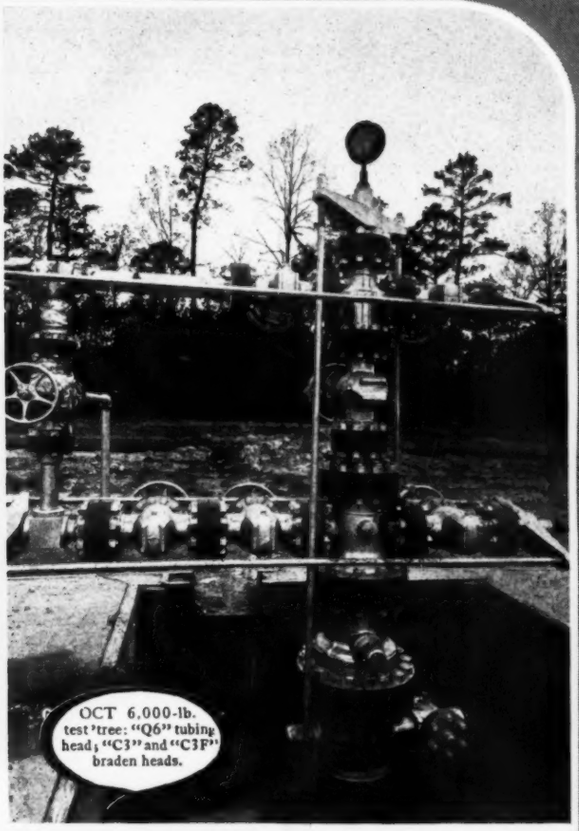
In drilling and coring, we have found our best results in recovery, clean cores, and in digging time, to be with but one or two points of weight and with table revolutions of about one hundred per minute. This procedure also causes the drilling of an extremely straight hole while coring.

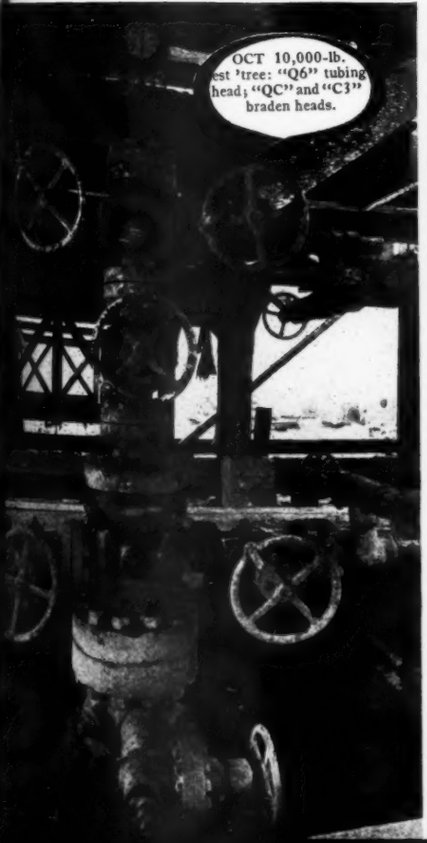
In pulling and in pumping down the core barrel, there have been no particular restrictions on speed, other than that of safety. This has not affected recovery except at very shallow depths where such a great speed is reached in pulling as to rattle the core out of the barrel.

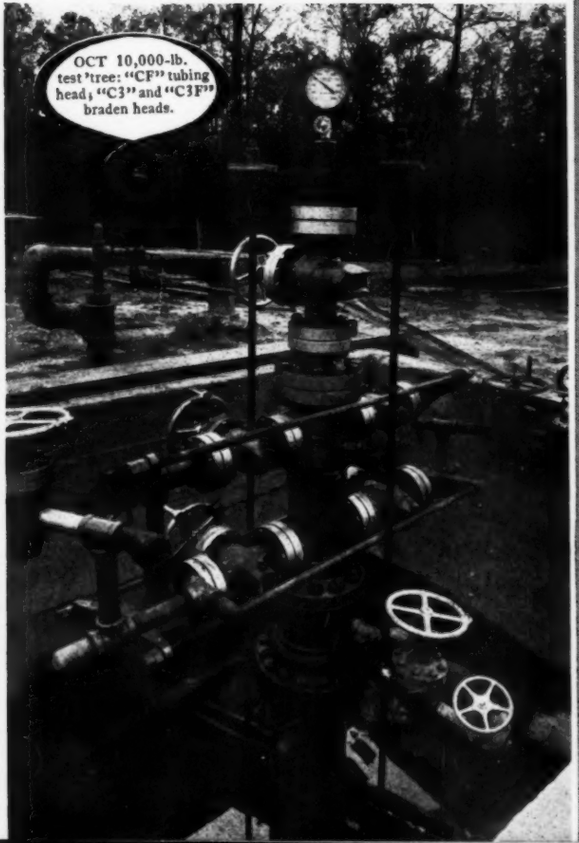
The use of the wire-line core barrel is especially applicable and economical in wildcat drilling, where a program of alternate coring and drilling may be applied. It is considerably more economical in deep coring than is the conventional type of core barrel, provided the cutter shoe can drill more than 20 ft. per bit. It *may be* more economical than conventional types for continuous coring in shallow holes. This depends upon the ease with which

(Continued on Page 74)

6 OUT OF 7 DEEP WELLS AT COTTON VALLEY COMPLETED THROUGH O-C-T TREES!







The deep Cotton Valley, Louisiana, field is a good one, and Cotton Valley operators are using good production equipment. Take the Christmas-tree hook-ups, for example. Out of seven wells producing from the deep pay, six of them are producing through O-C-T Assembled and Tested 'trees. And, incidentally, the class of safety provided by O-C-T Control Equipment is necessary for Cotton Valley deep pay. Depths run as much as 8,600 feet. . . . Pressures as high as 3,600 pounds.

Note, at left, the O-C-T Tubing Head — Braden Head combinations employed on the four Cotton Valley wells pictured. O-C-T Tubing Heads used in these 'trees permit the drilling in, running, and landing of tubing through blowout preventer equipment, either flanged or screwed. They also permit the lowering or raising of tubing against pressure, without killing the well. They are manufactured under U. S. Patents No. 2016454 and No. 2046579.

For complete details refer to the Tubing Head—Braden Head Section of the New O-C-T Catalog No. 37, just off the press.

OIL CENTER TOOL CO.

O-C-T

HOUSTON, TEXAS, U.S.A.

Cable Address "OCENTOL"

(Continued from Page 70)

the formations are cut. No critical depth can be given at which the wire-line should replace the conventional type in shallow holes. That depth will have to be worked out for each field.

Drilling records with wire-line coring equipment are remarkable. One well averaged 120 ft. per bit to 6500 ft., of which two-thirds was cored. A second well cored continuously in a 12¼-in. hole for 1100 ft. and used but 16 cutter shoes, an average of about 70 ft. per bit. A third well, coring in hard formations at 7000 ft., made 7 ft. per head with the conventional type, whereas when changed to wire-line the rate was 30 ft. per head.

Costs on the use of core bits are calculated from the following factors: *(See tables entitled Equipment Cost and Time Cost on this page.)*

The total unit equipment cost of the wire-line tool is considerably more than that of the conventional type. The saving, however, is made in two ways; the wire-line cutter shoe is kept in the hole longer, and digs from 50 ft. to 150 ft. per bit; the round trips with the drill pipe are consequently reduced to but one against the usual two to eight trips.

The apparent saving on equipment cost of the wire-line may be exaggerated. Most drillers usually change conventional core shoes every run, even though they are but slightly worn. More frequent re-runs would tend to draw the conventional cost closer to that of the removable type.

Following are typical cost figures for actual wells: *(See tables showing cost of medium deep wells in Fruitvale, California, and Deep Wildcat Wells in Kern County.)*

Rig time taken as $20.00 per hour. Assume digging speed—ft. per hour—the same for conventional heads as was true of the wire-line. The speed for the former actually would be slower unless full-hole drill pipe was used.

Until lately in California two companies handled all the wire-line core drilling. One has cored approximately 50,000 ft., and the other 80,000 ft. in California wells. Both have a grand total average recovery of over 80 percent. At present, approximately 27 wells now drilling in California are using wire-line equipment.

Recently, three more tool companies have entered the field. Two have the catch-lock type of inner barrel, released by action of the fishing tool, and use small cutter along with the large cutter shoe. The third uses a spring-lock type, which is closed and unlocked by means of a sort of wash-over pipe. This one also has the additional feature of replacing the blades for the large cutter shoe whenever the inner core barrel is run.

It is interesting to note other practical advantages existent because of use of the wire-line core barrel. The necessity of using full-hole drill pipe allows a larger quantity of drilling fluid to be circulated under less pressure. This may often account for faster drilling in a well that has changed over from ordinary drill pipe. In addition, together with the type of drill pipe, and the wire-line hoist on hand, we can now run single-shot compass survey machines without pulling the drill pipe from the hole, simply by running the machine below the bit away from the effect of the steel.

In summary: Wire-line core barrels have been used since 1926. First results in California were unimpressive. Due to this and lack of equipment, slow development was predicted; but by the end of 1936, 130,000 ft. of hole had been cored.

Data on the use of the tool show its most economical use to be in wildcat wells, intermittent coring, and in deep wells. Use in shallow wells depends upon formations. It has not eliminated conventional coring, particularly in shallow wells; in wells drilled by operators who have not the proper equipment; and in wells in which only a few cores are to be taken and which

(Continued on page 77)

Equipment Cost

Wire-line Core Barrel	*Conventional Type*
1. Cost of cutter shoe (total)	Cost of corebit
2. Cost of small cutter shoe (if used)	.....
3. Rental cost based on footage	.....
4. Daily rental cost (if any)	.....

Time Cost

(This is taken as dollars per hour to run a rig and should include labor, tool rental (or both as in a contract), fuel and water. It should also include something for mud and regularly-used small tools and supplies. A flat figure of $15 per hour is sufficient for the average medium shallow well.)

Wire-line Core Barrel	*Conventional Type*
1. Time cost while drilling	Same as wire-line
2. Time cost placing and removing wire-line inner barrel	Same as wire-line for item 1 and item 3

Round trip with drill pipe.

Fruitvale, California (Medium deep wells, average formations)

	8½-in. Hole, Well No. A and No. B (Wire-line used)		*Well No. A (Conventional Used)*	
1.	Depth—between 2700 ft. and 3792 ft.		3212 ft. and 3410 ft.	
2.	Footage cored—379 ft. at $1½/ft.	$ 570.00	198 ft.	
3.	Time on bottom—42 hr.	630.00	23.5 hr.	$ 352.00
4.	Round trips (d.p.)—(5) 13 hr.	196.00	(10) 21.75	325.00
5.	Round trips wire-line (33) 14 hr.	220.00	.....	
6.	Bit cost—large cutters	148.00		375.00
7.	Small cutter cost	90.00		
8.	Total	$1,854.00		$1,052.00

Cost per ft. cored for wire-line—$4.90; for conventional—$5.32.

Rig time taken as $15.00 per hour. Costs adjusted to present equipment prices. The above comparative costs per ft. show that for this field, this is about the critical depth.

Deep Wildcat Well in Kern County

	Actual Wire-line Data		*Estimated Data If Used Conventional*	
1.	Depth—7668 ft. to 10,014 ft.		Same	
2.	Footage cored—2244 ft. at $2/ft.	$ 4,488.00	2244 ft.	
3.	Time on bottom—558 hr.	11,160.00		$11,160.00
4.	Round trips (d.p.)—(36) 597 hr.	11,940.00	R. T. (est. 108) 1200 hr.	24,000.00
5.	Round trips wire-line (250)			
6.	Bit cost large cutters (1746 ft.) 23		1746 ft. (est. 80 heads)	3,260.00
	23 drag-bits $ 770.00		598-ft. 13 rock-heads	
	(598 ft.) 13 rock-heads 1,200.00	1,970.00	$1,500.00	4,760.00
7.	Small cutter cost (224)	672.00		
8.	Total	$30,230.00		$39,920.00
9.	Cost per ft. cored	$ 13.47		$ 17.80
10.	Average recovery (drag-heads) 71 percent			
	(rock-heads) 62 percent			

(Continued from page 74)

do not justify the extra equipment.

Discussion: (By J. E. Elliott, Elliott Core Drilling Company.)

Mr. Clark has handled his paper so well that discussion must largely be confined to emphasis on the various points touched upon, or, possibly, to further detail.

Although Mr. Clark states that the inner barrel is run into the hole at the same time as the drill pipe, the usual procedure is to run the drill pipe in without the inner barrel and to circulate thoroughly before the inner barrel is dropped. Circulation eliminates the heavy mud and cuttings from the bottom of the hole and probably largely accounts for the better recovery, faster drilling and greater footage obtained from the bits, as compared with conventional core bits.

Proper weight and speed depend, to a large extent, on the formation being cored, but it is quite noticeable that good cores can be taken with a wire-line core drill, using less weight than would be needed by a conventional core drill. This fact and the higher average speed mentioned by Mr. Clark undoubtedly aid in maintaining straight hole, but another factor deserves some of the credit. The working barrel of a conventional core drill is a joint of drill pipe or, in some instances, casing, which makes an excellent "limber joint;" whereas the working barrel of a wire-line core drill is a short drill collar. There is actually no greater tendency to drift off vertical with a wire-line core drill than there is while making hole.

Some operators using wire-line equipment are still having the best recovery with a table speed of approximately 50 r.p.m., but perhaps as the crews become more familiar with wire-line coring technique they can obtain an equal recovery with higher table speeds.

I do not agree with Mr. Clark in his statement that there are no particular restrictions on speed when retracting the inner barrel. In internal flush pipe it seems to be quite all right to pull the inner barrel within the restrictions mentioned by Mr. Clark. However, in internal upset drill pipe, particularly that fitted with standard tool joints, it has been found that a speed in excess of about 300 feet per minute tends to cut down core recovery. At greater speed the inner barrel strikes the tool joints and there may be a tendency to rattle out cores of soft sand or broken shale.

Several operators in California have found that it *is* economical to core shallow holes with wire-line core drills. Recent examples of this are the latest wells drilled by Associated Oil Company in the Lost Hills area at depths ranging from 800 to 1500 feet. These wells were drilled with 13½-in. and 8½-in bits, taking 2⅜-in. core and averaged over 100 ft. per bit with a recovery in excess of 90 percent.

In the comparison of costs of the conventional barrel versus the wire line, no mention has been made of the wear and tear on equipment. While this is a variable and intangible item, it can amount to a very considerable sum, including as it does, lost rig time. For instance, in the Universal well drilled at Gardena, coring started at 1500 ft. and extended to over 8000 feet. Only 57 wire-line bits were used in making this 6500 ft., of which 4800 ft. was cored. Had an equal amount of coring been done with a conventional core drill an additional two hundred round trips would have been required. The elimination of round trips in this case allowed the drilling of this entire hole without changing the drilling lines.

In addition to being able to run a single-shot survey without pulling the drill pipe from the hole, it is also possible to drop an Inclinometer into the hole prior to extracting the inner barrel or drilling assembly and to remove it at the same time as the inner barrel with practically no lost time.

It might be interesting to note at this time that a third type of retractible core barrel has been tested. Some three or four years ago, one of the larger oil companies started experiments with a core barrel in which the inner barrel was retracted by reversing the circulation. However, it is understood that due to certain disadvantages inherent to a reversal of circulation, the experiment has now been abandoned.

Although the present core recovery with wire-line equipment has been satisfactory, it is my opinion that recovery will increase. There is some difference between the technique of coring with the wire line and that of the conventional barrel, and as the crews become more familiar with this new equipment their core recovery increases. In addition, we can expect continued improvements on the part of the manufacturers.

I agree with Mr. Clark that the wire-line core drill will never eliminate the conventional core drill, but it has earned a very definite place among oil tools. For spot coring in the softer formations, for continuous coring, particularly at depth, for the occasionally required short core at critical points, it cannot be equalled by the conventional core drill.

Protection of Fresh-Water Horizons in Oil Fields of Kansas

THE two most promising methods of brine disposal in oil fields at present are controlled dilution in surface streams at flood stage, and injection into subsurface formations, according to the United States Bureau of Mines, Department of the Interior. This view, with substantiating evidence, is contained in a paper summarizing advancements toward protection of fresh-water horizons in oil-producing areas from mineralization by oil-field brines, presented by C. J. Wilhelm, petroleum engineer of the Bureau, at the 29th Annual Meeting of the Kansas Engineering Society, Topeka, Kansas. The paper, based upon coöperative work by the United States Bureau of Mines and the Kansas State Board of Health, also outlines difficulties encountered in disposing of oil-field brines in Kansas by present methods and shows that, despite these hindrances, oil operators are making a decided effort to return brine to some subsurface formation. Clogging of the disposal formation by solids carried in suspension or precipitated from solution is the principal difficulty experienced in applying the underground disposal method, and a continued coöperative study of the technical phases of this problem is required before this method can be applied economically to many Kansas oil-producing areas.

As of January, 1937, the Kansas State Corporation Commission has approved 101 applications for subsurface disposal wells and 81 applications for water-repressuring wells. A large percentage of these projects are being developed on the basis of a combination of brine-disposal and increased oil-recovery methods.

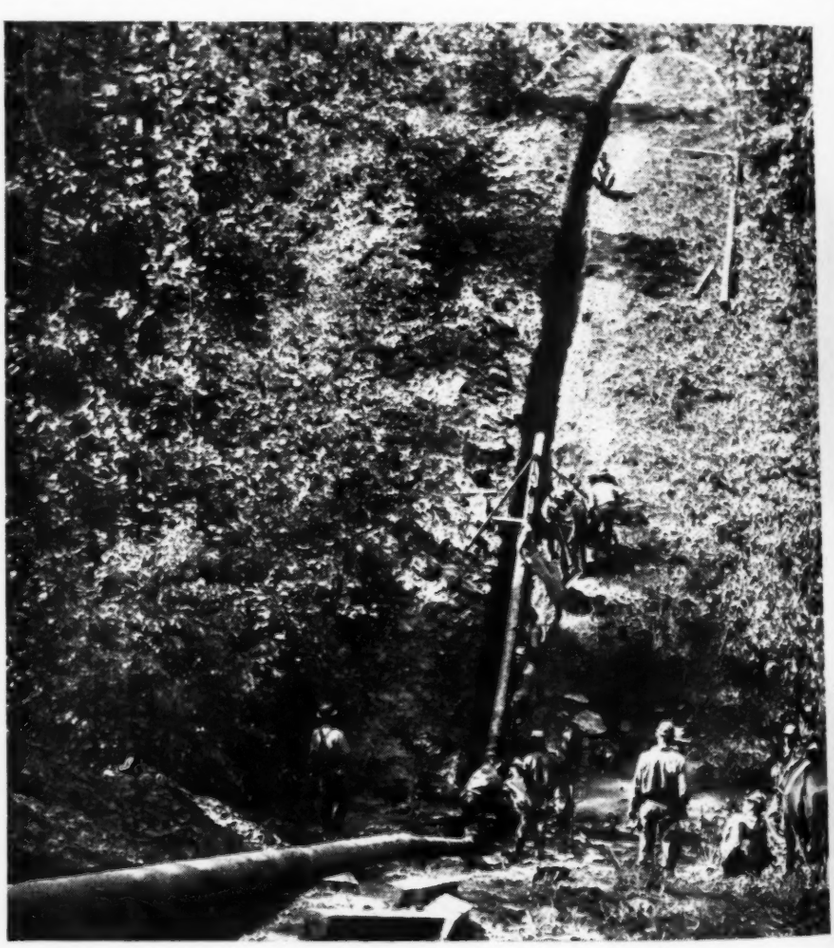
The complete paper, "Protection of Fresh-Water Horizons in Oil-Producing Areas (with special reference to Kansas)", by C. J. Wilhelm, associate petroleum engineer, United States Bureau of Mines, has been printed by the Kansas State Board of Health. The booklet of 15 pages and seven illustrations may be obtained without cost upon application to the Information Division, United States Bureau of Mines, Washington, D. C.

Using the "grasshopper" to align and hold pipe lengths while welding

Laying a Pipe Line By The "Stove-Pipe" Method

WELDING a pipe line by the "stove-pipe" method is a comparatively new procedure that has come into rather widespread favor. With this method of construction all welds are position welds. The pipe is strung in the conventional manner, but the workmen begin operations bunched together at one end. The first length of pipe is lined up on skids over the ditch. The second length is then rolled on to the skids and lined up with the first by means of a pipe clamp, or, as in the case of a recent job in the southeast, a "grasshopper." The "grasshopper" is an interesting piece of equipment, being a unit lever and fulcrum that fits on top of one length of pipe and reaches over to pull the next length into place. The "grasshopper", shown in an accompanying illustration, was fabricated entirely from 2-in. pipe by welding. When the two joints of pipe are lined up the tack weld is made. The tack-welder and the workman handling the "grasshopper" then move on to the next joint, which is lined up and tack-welded in the same manner.

Immediately following, the welding operators make the complete bell-hole or position weld, two operators working simultaneously on each joint. One operator begins at the top of the pipe and welds down on his side, completing one-quarter of the weld. At the same time the operator on the opposite side begins at the half-way mark and welds to the bottom-center point. The first operator continues his weld until it is completed at the bottom, where he meets and joins the weld of the second workman. While the first operator is working his second quadrant the second operator moves to the top of the pipe and welds downward on his side until all four quarters are filled in and joined completely without interference on the part of either operator.



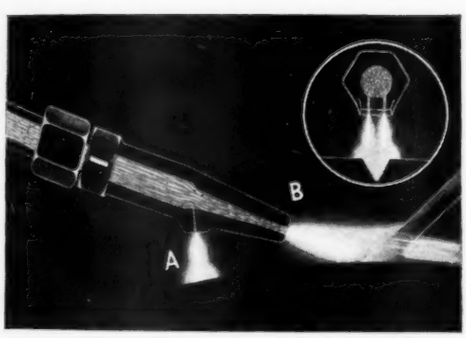
The close grouping of the gang of welding operators and others is evident

Pipe lines are rugged..

when Multi-Flame Lindewelded

RUGGED pipe and rugged joints are required to withstand the rough treatment of overland pipe-line construction. With Multi-Flame Lindewelding, you can develop the full strength of the pipe itself in every joint, even when the tensile strength of the pipe is 110,000 pounds per square inch. A properly made Lindeweld will consistently resist the standard 90 degree backward bend without showing any evidence of weakness.

Ask your Linde representative or the Linde office near you for complete information and the new booklet, "Lindewelding Pipe Lines." The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation, New York and principal cities.



This schematic cross section shows the Multi-Flame Lindewelding Head in action. The small flames, A, preheat the pipe while the main flame, B, melts the welding rod and postheats the weld. In the circle is a cross-sectional view through the preheating flames, A.

A construction scene on a 35-mile 16-inch Lindewelded gas line in California.

Everything for Oxy-Acetylene Welding and Cutting

LINDE OXYGEN • PREST-O-LITE ACETYLENE • OXWELD APPARATUS AND SUPPLIES FROM UCC LINDE UNION CARBIDE

Making position welds on the line

They are then ready to move on to the next joint.

The use of the "grasshopper" for lining up pipe was employed recently in laying a natural gas line in the southeastern part of the United States where standard weight pipe was taken up, reconditioned, beveled with the use of an oxy-acetylene pipe-beveling machine, and relaid, employing the Lindeweld technique. For true "stove-piping" as developed in the oil country, however, a pipe clamp is used instead of the "grasshopper." The "grasshopper" comes from the "stab-on" system, requiring an even smaller organization than the one discussed here. In the "stab-on" method the pipe joints are not tack-welded but completely welded in one operation, thus eliminating entirely the tack welding. Although the number of men required in the "stab-on" method is less than for "stove-piping" the mileage also is not so great.

The "stove-pipe" method of laying a pipe line has been found highly successful under a good many circumstances. Immediate welding costs, computed on a per-weld basis, are equal to or slightly higher than those for multi-flame Lindewelding on rolling welds, but the overall cost for the job frequently is less.

Huge High-Pressure Natural Gasoline Storage Tank Being Constructed at Port Arthur, Texas

A COMPANION to the world's largest high-pressure storage tank, a 100,000-bbl. Hortonspheroid, is now being constructed at Port Arthur, Texas, for the Warren Petroleum Company of Tulsa, Oklahoma.

Resembling in shape a huge drop of mercury, the tank will be used to store natural gasoline, which refineries blend with the products of their stills to increase the volatility of motor fuels to proper specifications.

The first tank of this type was erected at Port Arthur in 1936. It measures 50 ft. in height by 140 ft. in diameter, and was designed to withstand a pressure of ten lb. to the sq. inch.

The tank now under construction will be constructed of thicker plates, as it will contain a more volatile liquid and will hold a pressure of 15 lb. to the sq. inch.

The Hortonspheroid, which is being constructed by the Chicago Bridge and Iron Company, has been developed to withstand strong internal pressure, which sets up such high stresses in metal that the ordinary cylindrical cone roof tank would be unsatisfactory.

A drop of mercury, in assuming a spheroid shape, automatically equalizes the stresses within its structure. Following this theory, the spheroid tank was devised.

The Warren Petroleum Company has erected a terminal at Port Arthur for full cargo loadings or for topping ships, that is, introducing natural gasoline into crude oil for export.

Natural gasoline for storage at Port Arthur is brought in tank cars from points in New Mexico, Oklahoma, Louisiana, and Texas.

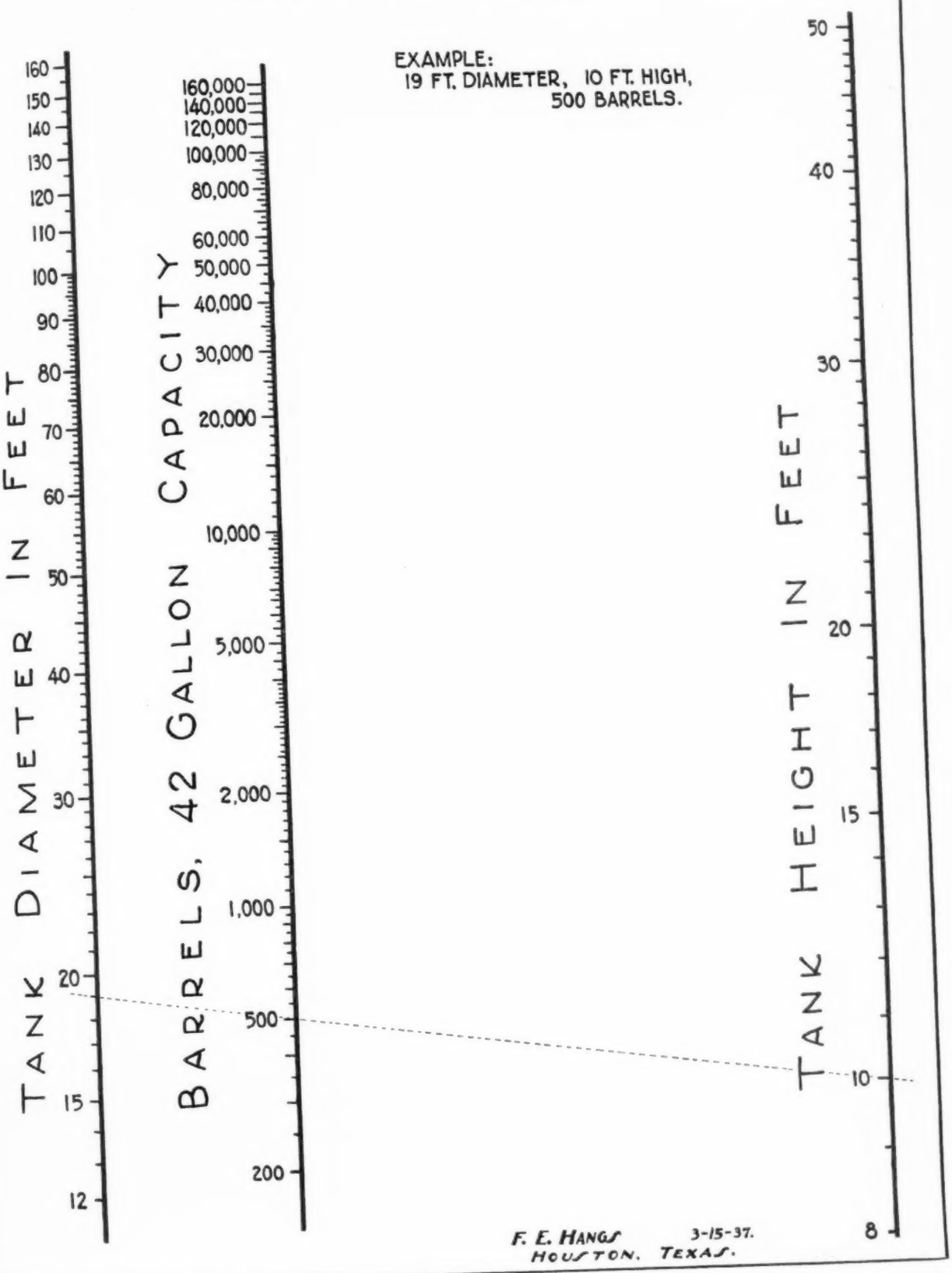
The Spence and Howe Construction Company of Port Arthur has been given the contract for driving 1200 60-ft. foundation piling for the second Hortonspheroid.

Other companies have been erecting Hortonspheroids for storing natural gasoline, but the large units being constructed at Port Arthur for the Warren Petroleum Company will make possible an unusual concentration of this product.

View of the 100,000-bbl. Hortonspheroid at Port Arthur, the largest pressure container of its type in existence. A companion to this tank is now under construction for the Warren Petroleum Company, Tulsa, Oklahoma

CAPACITY OF OIL TANKS

ALIGNMENT CHART



Annual Convention of the Natural To Be Held in Tulsa, Oklahoma

May 19, 1937

Morning Session

Special open meeting of Gas Contract and Technical committees.

Afternoon Session

Opening Address: "Texas' Contribution to the Natural Gasoline Industry," Col. Ernest O. Thompson, Commissioner, Railroad Commission of Texas.

President's Address: T. R. Goebel, Shell Petroleum Corporation.

Committee Reports: Gas Testing Committee, Gas Contract Committee, Technical Committee.

Appointment of Nominating Committee.

May 20, 1937

Morning Session

E. L. Peck, Empire Oil and Refining Company, chairman.

"A History of Vapor Lock Research," G. G. Oberfell, Phillips Petroleum Company.

"Present Motor Cars and Their Fuel Problems," E. H. Shepard, Chevrolet Motor Company.

"Precision Gas Analyses," W.F.Fulton, United Gas Public Service Company.

Presentation of Hanlon Award.

W. E. REARDON, Vice-President

T. R. GOEBEL, President

FRED F. KETCHUM, Vice-President

Officers of The Natural Gasoline Association of America

R. E. HAYLETT, Vice-President

WILLIAM F. LOWE, Secretary-Treasurer

Gasoline Association of America, . . . May 19, 20, and 21

Afternoon Session

Emby Kaye, Skelly Oil Company, chairman.

"Combined Crude Stabilization, Natural Gasoline and Pressure Maintenance Operations," E. O. Bennett and C. R. Williams, Continental Oil Company.

"The Role of the Free Radical in Polymerization," S. C. Carney, Phillips Petroleum Company.

"Polymerization and What It May Mean to the Natural Gasoline Industry," G. G. Brown, University of Michigan.

"Refiners' Viewpoint," Stewart Giraud, Humble Oil and Refining Company.

May 21, 1937

Morning Session

H. W. Harts, Natural Gasoline Corporation, chairman.

"Operating Kinks" Session. Entirely devoted to the presentation and discussion of original operating ideas submitted by field, plant, and laboratory men. Review of late developments.

Afternoon Session

"Trends Influencing the Natural Gasoline Industry," W. T. Ziegenhain, *The Oil and Gas Journal*.

Presentation of "Operating Kinks" prizes.

G. G. BROWN, "Polymerization and What It May Mean to the Natural Gasoline Industry."

ERNEST O. THOMPSON, "Texas' Contribution to the Natural Gasoline Industry."

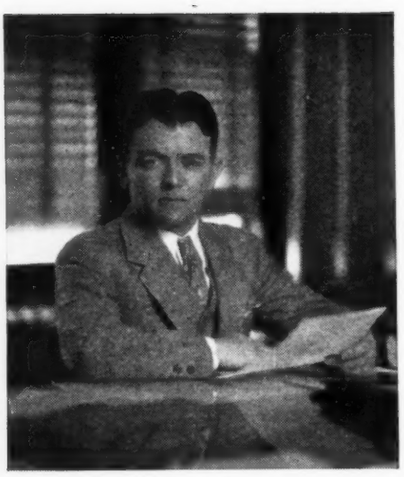
G. G. OBERFELL, "A History of Vapor Lock Research."

E. O. BENNETT, "Combined Crude Stabilization, Natural Gasoline and Pressure Maintenance Operation," in conjunction with C. R. Williams.

Some of the Speakers for N.G.A.A. Meeting

STEWART GIRAUD, "Refiners' Viewpoint."

E. L. PECK, Chairman Morning Session, May 20.

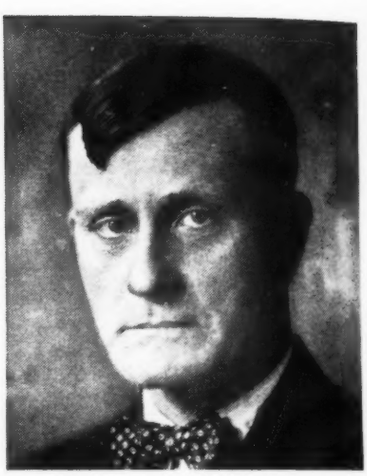


EMBY KAYE, Chairman Afternoon Session, May 20.

H. W. HARTS, Chairman Morning Session, May 21.

C. R. WILLIAMS, "Combined Crude Stabilization, Natural Gasoline and Pressure Maintenance Operation," in conjunction with E. O. Bennett.

Will Take Prominent Part in N. G. A. A. Meeting



S. C. CARNEY, "The Role of the Free Radical in Polymerization."

New Plant for Mining and Refining Bentonite

ONE of the most modern and up-to-date plants for the mining and refining of Bentonite recently was completed and placed in operation by the Wyodak Chemical Company, main offices Cleveland, Ohio, on their extensive holdings covering several square miles. This new plant at Upton, Wyoming, is designed for a capacity of 500 tons daily. Caterpillar tractors with bulldozers are employed for removing overburdens, with gas shovels for truck loading.

The pure Bentonite is stacked in piles and allowed to weather. At the present time more than 60,000 tons are stacked. From the stock piles Bentonite is carried to crushers and reduced to approximately the size of a hickory nut. The crushed material is elevated to oil-fired driers 40 ft. by 5 ft. and dried at low temperatures to avoid breaking down the colloidal properties of the Bentonite. The crushed and dried Bentonite is then carried to Raymond Mills and ground to several air-floated finenesses. From these mills the material is carried to the bagging machines. Electric power is generated from Fairbanks-Morse Diesel engines and all equipment is direct motor drive.

In Case You Haven't Heard..

We Take Great Pleasure In

ANNOUNCING

our appointment as exclusive distributors for Dresser Style 65 Pipe Fittings in the Southwest territory.

WHAT THIS MEANS TO YOU

Style 65 Fittings are great time, labor, and money savers. NO THREADING OF PIPE IS REQUIRED. Just take plain-end pipe, a Style 65 Fitting, and in less than a minute—with a few turns of a wrench—you can make a permanent oil-tight, gas-tight, FLEXIBLE pipe connection! Every joint acts as a union. Exact lengths of pipe are unnecessary.

WHERE YOU CAN USE THEM

Style 65 Fittings are recommended for use on all kinds of new or existing pipe lines, for oil, gas, water, hot water, air, etc.

Users say they are one of the handiest pipe joints on the market today. Write us for a sample, sent free, without obligation.

STOCKS

For your convenience, a complete stock of Style 65 Fittings (couplings, ells, and tees—½ in. I.D. to 2 in. I.D. inclusive) are maintained at both Tulsa and Houston.

Style 65 Coupling (standard length body)

Style 65A Coupling (extra-long body)

Style 65, 45-deg. Ell

Style 65, 90-deg. Ell

Style 65 Tee

WESTCOTT & GREIS, INC.

DIVISION OF AMERICAN METER COMPANY, Inc.

DALLAS HOUSTON TULSA

Safety to be Featured at Houston Oil Show

FOLLOWING a meeting of the Safety and First Aid Committee of the Oil-World Exposition, composed of J. J. Delahide of the E. D. Bullard Company, chairman; Ed Lenzner, assistant chairman, and the following committeemen: George J. Gruber, Mine Safety Appliances Company; R. B. Roaper, safety engineer, Humble Oil and Refining Company; Claude Liles, safety engineer, Magnolia Petroleum Company; Pete Keegan, safety engineer, Shell Petroleum Corporation; Tom Brown, safety engineer, Gulf Production Company; Jerry Lockwood, safety engineer, Empire Oil and Refining Company, Bartlesville; Cecil Hightower, safety engineer, United Gas Public Service Company, and C. A. Miller, safety engineer, The Texas Company, an outline of the program and the activities of the safety and first aid division has been agreed upon by the committee. A buffet luncheon will be given during exposition week on Wednesday, October 13, at 12 noon, and a talk will be presented on safety with demonstrations of personal protective equipment under the supervision of Cecil Hightower of the United Gas Public Service Company as chairman.

The Oil-World Exposition championship first aid contest will be held on October 13 at 7 p. m. P. E. Keegan of the Shell Petroleum Corporation and T. H. Felds of the Harris County Emergency Corps will be in charge of the contest rules, training of the judges, and selection of the qualified officials. They will be assisted by contesting first aid team instructors. At the completion of the first aid contest and prior to the distribution of the awards and prizes, entertainment will be given for all members of the various first aid teams, friends and visitors. Geo. J. Gruber of the Mine Safety Appliances Company will be chairman of the entertainment committee.

A special safety committee with Chas. A. Miller, safety engineer of The Texas Company, as chairman has been appointed to supervise and check all exhibits and all operating equipment of the various exhibitors during the entire week of the exposition. This committee will make recommendations of any hazardous or any unsafe exhibits or any features of the exhibits that may, in the committee's opinion, be unsafe; and from its recommendations any necessary changes can be made immediately.

A special fire prevention committee with R. B. Roaper of the Humble Oil and Refining Company as chairman will be in charge of the selection of the proper types of fire-fighting equipment to be placed in the various parts of the main exposition building, outdoor exhibits, as well as the tent; also selection of the personnel to carry out the fire prevention program of the exposition.

G. O. Lockwood, manager of the Empire Oil and Refining Company, has been appointed chairman of the prizes and trophies committee; Claude Liles, safety engineer of the Magnolia Petroleum Company, Beaumont, has been appointed chairman of the publicity committee of the safety and first aid division, and T. F. Brown of the Gulf Casualty Company of Houston has been appointed chairman of the first aid contest and space.

The entire oil industry will be asked to cooperate in making Wednesday, October 13, the "Safety Day." A general invitation will be sent to field superintendents, foremen, and officials to be present on "Safety Day" and give their full coöperation.

Elimination contests now are being held by first aid teams of the leading oil companies, and the winners of these contests will be entered in the first aid contest at the exposition to be held in Houston, Texas, October 11-16, 1937. The committee anticipates a larger number of teams participating in the 1937 contest than in any previous first aid contest.

Standing, left to right: Ed Lenzner, manager, Oil-World Exposition, Inc.; C. B. Boone, secretary, Petroleum Safety Engineers Club; C. L. Hightower, safety director, United Gas Public Service Company; Lee Connors, safety engineer, The Texas Company; Fred Rousseaux, safety engineer, The Texas Company; Geo. J. Gruber, safety engineer, Mine Safety Appliances Company. Seated, left to right: Wm. Grant, safety engineer, Humble Oil and Refining Company, Refinery Division; Vick Hayslip, safety director, Humble Oil and Refining Company, Production Division; J. J. Delahide, district manager, E. D. Bullard Company; P. E. Keegan, safety engineer, Shell Petroleum Corporation; and Claude Liles, safety engineer, Magnolia Petroleum Company.

Jack J. Doyle Heads Oil Producers Agency of California

Jack J. Doyle, well-known Los Angeles oil man, was elected president of the Oil Producers Agency of California at the annual election meeting of the board of directors. The new president of the agency also is president of the Doyle Petroleum Corporation, the Elyod Oil Company, and general manager of the Doyle-Clune Oil Company.

JACK J. DOYLE

In addition to electing a new president, the agency board also elected three new vice-presidents and a secretary-treasurer. C. C. Spicer, Laurence C. Kelly, and William J. Schultz are the new vice-presidents; and Frank Travers is the new secretary-treasurer.

HANDBOOK

THE PETROLEUM ENGINEER,
P. O. Box 1589, Dallas, Texas.

☐ Here's $2.00 for One Year's Subscription to The Petroleum Engineer, including The Petroleum Engineer's Continuous Handbook.

☐ Here's $1.25 extra for the Special Binder for The Continuous Handbook.

Name _____ Company _____

Title _____ State _____

Street _____

City _____

Please check division in which you are engaged:

☐ Producing ☐ Natural Gasoline ☐ Supply
☐ Refining ☐ Pipe Line ☐ Manufacturing

SEND this Subscription Card in TODAY. Your check for $2.00 will bring you THE PETROLEUM ENGINEER for One Year, including The Continuous Handbook Section. A limited number of additional copies of the June issue (containing Installment I of the Handbook) will be printed, so it is IMPORTANT that your Subscription be sent NOW.

Check this description of topics to be covered in THE PETROLEUM ENGINEER'S Continuous Handbook!

DRILLING. The tables under drilling will have to do with the solution of problems that arise in daily practice such as: what quantity of drilling mud is in the hole, with the drill pipe either in or out of the hole; how long will it take for the cuttings to come to the surface when the pump speed or velocity of the fluid is known; what quantity of cement is required to cement a string of casing; what is the volume of the annular space behind the casing. All quantities will be expressed in units that are used daily in the field and will answer such questions as: how far the mud-fluid level in a hole is depressed when the drill pipe is pulled; how much cement is required to fill the hole; what is the total quantity of mud-fluid in the hole during drilling?

Numerous problems connected with drilling will become easy of solution, such as the deviation of the hole from the vertical, weight of drill stem and casing, buoyancy of drilling mud, capacity of mud pumps, heat loss from steam lines, rate of settling out of cuttings from mud, and the like.

PRODUCTION. The tables under production will be concerned with such questions as: the flow through different sizes of tubing; the capacity of oil well pumps; the weight of sucker rods in fluid; the strength of sucker rods; the volume of flood-water required per acre in water-flooding operations; the capacity of sands for storing oil or gas; the relation between inches of water pressure, pressure in inches of mercury, and lb. per sq. inch. These and many other questions the tables will aid in answering.

REFINING. Many problems arise daily in connection with refining processes. Their solution can be facilitated by the use of tables. Among the many adaptations of tables are those on: The maintenance of refining equipment and capacities; temperature-gravity corrections for oil volumes; the relation between A.P.I. gravity, specific gravity, and density; the relation between the different types of viscosimeter readings; viscosity-temperature; points of greatest corrosion in refinery equipment, and suggested remedies. These are but a few of the many diversified subjects upon which tables of interest to operating men in the refinery will be compiled.

NATURAL GASOLINE. In this section the solution of everyday problems of the operating man can be aided by reference to tables. Such problems as those involving: the vapor pressure of gasoline with relation to its temperature; the correction of uncorrected vapor pressures to Reid vapor pressures; the relation of octane number to Reid vapor pressure for natural gasoline; the vapor pressure of hydrocarbons; vaporization equilibrium constants; latent heat of normal natural gasoline hydrocarbons; barometer readings, boiling points, and altitude; absorber efficiency and mineral seal oil rates; temperatures of compression of natural gas; shrinkage or expansion of gasoline with variation in temperature.

NATURAL GAS. Closely related to the problems of natural gasoline are those involved in the production and transmission of natural gas. Natural gas measurements adapt themselves well to the use of tables: meter coefficients and meter capacities; ignition pressure of air-gas mixtures; compressor capacities and displacements; condensers and cooler capacities; gas transmission by pipe line; density of gas at a certain pressure and temperature; the measurement of flow from a gas well. Questions on these topics arise daily.

PIPE LINE. Tables in this section will include: the flow capacity of lines with respect to their length, diameter, pressure, temperature and viscosity of the fluid; tank capacities; pump capacities; storage capacity of lines; the calculation of how much oil can be pumped through a line of a certain size at a given pressure. Common types of problems involving such questions can be solved conveniently by the simple means of tables.

Special Looseleaf Binder

of flexible leatheroid, designed especially for The Petroleum Engineer's Continuous Handbook with divisional tab index, will be supplied to subscribers for $1.25 additional (our actual cost in quantity lots)

THE *Petroleum* Engineer

Forecasting the Oil Demand and Supply

Proved methods of estimating consumption and production for price-forecasting purposes

By CAMPBELL OSBORN

CHANGES in crude oil prices called for by relations of demand and supply may be postponed, but ultimately they are made. Executives and engineers who know, on the basis of these relationships, what oil prices should be, are valuable to the industry and to the consumer and helpful to their companies. The problem is one of mixed engineering, geology, and economics. It is a fit problem for engineers to tackle. It is a problem that constantly must be studied, for, as oil men well know, petroleum conditions change rapidly. Spasmodic or haphazard work will not yield satisfactory results.

General Features of the Demand

As demand is "the horse that pulls the cart," the first step is the forecasting of consumption. Before this can be done the forecaster must have a thorough knowledge of the history of consumption and exports, of the important consuming agencies, of general business conditions, and of the work that has been and is being done in forecasting. These essentials can be acquired only by long years of experience in oil, and an intelligent, thorough-going study of what reliably has been written on the subject.

Members of the petroleum industry are aware of the fact that since 1911 motor fuel has been the leading commercial product of oil. Enough of the other products for consumptive needs, except fuel oil, are obtained as by-products. The residual fuel oil is supplemented by low-grade crude produced in California and Texas, and used as fuel with little or no treating. The export trade in oils is an important outlet, but the volume, compared to domestic demand, is lessening with the passing of years.

Experience shows that increases in demand vary widely from year to year. The annual gains have been from four to 25 percent, and in a few years there have been losses. The large gains were in abnormal war years or during the rise in the use of the motor car. Recently the changes have been more settled. Moreover, the consumption of petroleum products is affected by seasonal conditions. The writer's own work on the subject indicates to him that the best results in forecasting are obtained by studying the products separately and by quarters of each year.

The Growing Demand for Gasoline

The demand for gasoline long has constituted nearly one-half the total oil consumption. America is already on wheels, but something seems to keep increasing the number of wheels and the extent of their operation. Export of gasoline, though substantial, is small compared to domestic demand. Because of the limited number of foreign motor vehicles and the policy of developing their own oil resources adopted abroad in the past two decades, prospects for large gains in gasoline exports are not promising. Domestic demand and exports should be estimated separately.

There are two ways of measuring the future domestic gasoline consumption. One is by studying the consuming agencies and the other by projections of trends. If carefully done by experienced men, both are good methods, and each should be used to verify or modify the other. For short-term forecasting the former should be given more weight than the latter. Good short-term forecasting, say for periods of from three to six months, should yield results that will not vary more than one percent from actual subsequent consumption.

The passenger car and truck are the largest users. Reliable data should be assembled from the automotive industry and from governmental sources, showing the figures of vehicles on hand and in use in the beginning of the period to be studied, the estimated output and sales during the period, and the number of vehicles that will be scrapped. These figures will show the average number of vehicles that will be operated during the period under scrutiny.

The next step is to apply the consumption per car per day for the period or season for which estimates are wanted. Good typical statistical modes obtainable by close observation of the quarterly consumption per vehicle are helpful at this juncture. (A mode is not an average, but is a figure or other measurement that occurs most frequently in an array of similar comparative statistics.)

The consumption data per vehicle are obtained by studies of past demand. In arriving at a final estimate due weight must be given to comparative indices of farm and labor prosperity. The laborer and farmer are, of course, the largest users of motor vehicles and gasoline. Nowadays ample indices on the business of steel plants, the railroads, farm prices, wages of labor, and farm conditions are available. There are rather marked increases and decreases in annual consumption per car due to changes in general business conditions and improvements in engine design, and to the large consumption of gasoline by buses and trucks (two to six times that of passenger car consumption) that cannot be segregated in the statistics.

In normal years there seems to be an annual gain in the use of fuel per vehicle. In early years the consumption was 450 gal. annually. Later it was 600 gallons. The change was caused by road improvements and betterments in the vehicles so that they could be operated the year 'round, and to the wider use of buses and trucks. It seems probable that the growing use of the trailer will increase further the average consumption per vehicle.

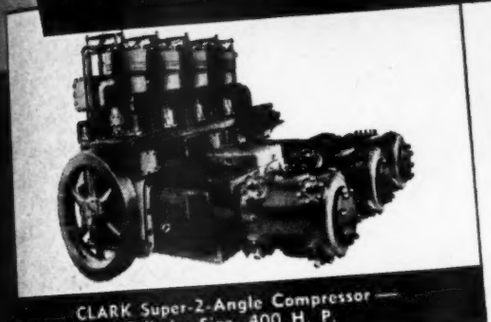
Aviation gasoline demand is growing and this is a factor that must be studied separately. There are no separate figures on the miscellaneous uses of gasoline for cleaning, motorcycles, and stationary engines, but this use is small and is lumped by the statistician with the general domestic demand.

In order to complete the picture obtained by this method, exports must be added. The export figures cannot be estimated by the unit process described, for no figures are available on foreign

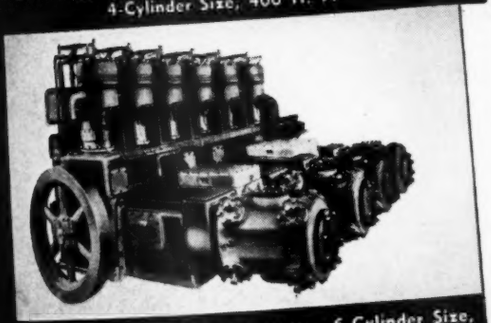
(Continued on Page 94)

Proven IN SERVICE IN NATION'S LEADING PLANTS

A Big Compressor that is PORTABLE!



CLARK Super-2-Angle Compressor — 4-Cylinder Size, 400 H. P.



CLARK Super-2-Angle Compressor — 6-Cylinder Size, 600 H. P. Also built in 2 and 3-Cylinder sizes.

The CLARK "Super-2-Angle" represents a REVOLUTIONARY change and improvement in large compressors. Among its entirely new advantages, PORTABILITY stands out as highly important. The "Super-2-Angle" is shipped *assembled*. This greatly reduces cost of transporting and erecting.
4 other important savings are introduced by the "Super-2-Angle", viz:

SMALLER FOUNDATION due to compact right-angle design
LESS FLOOR SPACE, SMALLER BUILDING
FUEL ECONOMY, due to CLARK Super-2-Cycle Fuel Injection
LOWER MAINTENANCE due to extreme simplicity of design and few parts.

The CLARK "Super-2-Angle" offers other highly valuable improvements. On the market a full year, it has been proved in actual use, in the nation's leading plants. Write for literature or

See CLARK Section, 1937 Composite Catalog

CLARK BROS. COMPANY . . . . . Olean, New York, U. S. A.

Export Office: 30 Rockefeller Plaza, New York. Midcontinent Sales Offices and Warehouses: Tulsa, Okla., and Houston, Texas. West Coast Office: Smith-Booth-Usher, 2001 Santa Fe Av., Los Angeles, Cal. Foreign Offices: 72 Turnmill St., E. C. 1, London, England; 4 Str. General Poetas, Bucharest, Roumania.

CLARK

(Continued from Page 92)

consumption per car; however, as exports are a small part of the total, the monthly figures that may be read from a projection of the export curve at the going rate, tempered by indices of international trade and finance, will afford information accurate enough for the purpose in mind.

The method of estimating domestic gasoline demand for one or two three-month periods by the extension of a curve at the going rate is simpler than the unit process just described, and is satisfactory for years that are not abnormal.

Figures should be assembled and a curve plotted for several preceding years on charting paper with a coördinate time scale and a logarithmic or percentage volumetric scale. Semilogarithmic or ratio charts are preferable to curves plotted on coördinate paper. Logarithmic vertical scales are recommended simply because they show ratios and thus facilitate projection at the existing rate of increase or decrease. The accompanying chart of a forecast for the first quarter of 1937 illustrates the writer's method of projecting the quarterly seasonal consumption at the going rate.

Domestic Kerosene Consumption and Exports

The domestic and export demand for kerosene represents a very small part of the total demand for oil. Though the consumption fluctuates slightly from year to year, there is no definite movement upward or downward. The export trade constitutes a large proportion of the kerosene outlet. This trade, however, shows no tendency to increase. Twenty years ago kerosene was exported at about the same rate as in 1932.

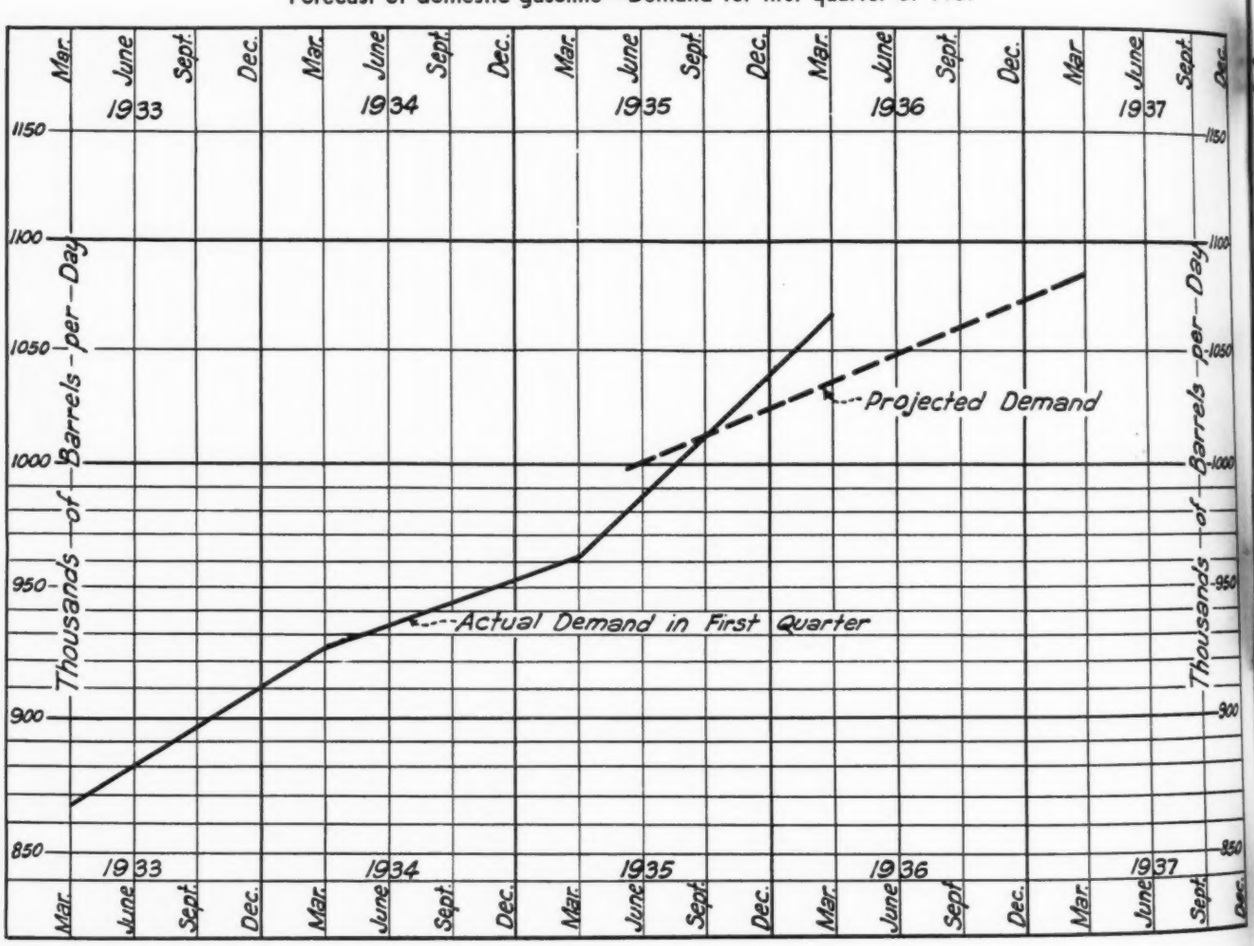
Kerosene demand cannot be estimated by the unit method as there is no way of ascertaining the number of consuming instrumentalities nor the demand per agency. With certain modifications and allowances the method of forecasting corresponds to the projection process described for gasoline. The first step would be the preparation of charts.

As would be expected from its nature as a fuel, it will be noted that there is something of a seasonal variation in the demand for kerosene. Fall and spring tractor plowing, coupled with the cold dark months of winter, increase the domestic consumption, and presumably the latter influences are at work abroad.

It is not considered necessary to segregate domestic and export demand for forecasting purposes. The problem is simply one of allocating the annual demand to the several quarters of the year by the quarterly-plot method suggested for gasoline. As consumption and exports change little from year to year, it also would be possible and probably preferable to estimate the combined annual domestic and export demand on the basis of the existing rate of increase and divide it among the several quarters of the year by the use of quarterly percentage figures based on past years.

Because of the importance of export kerosene, economic conditions abroad should be studied, and, since the principal outlet in this country is in the rural districts for lighting and plowing, farm prosperity or adversity and tractor operation should be used as a check upon the estimated annual con-

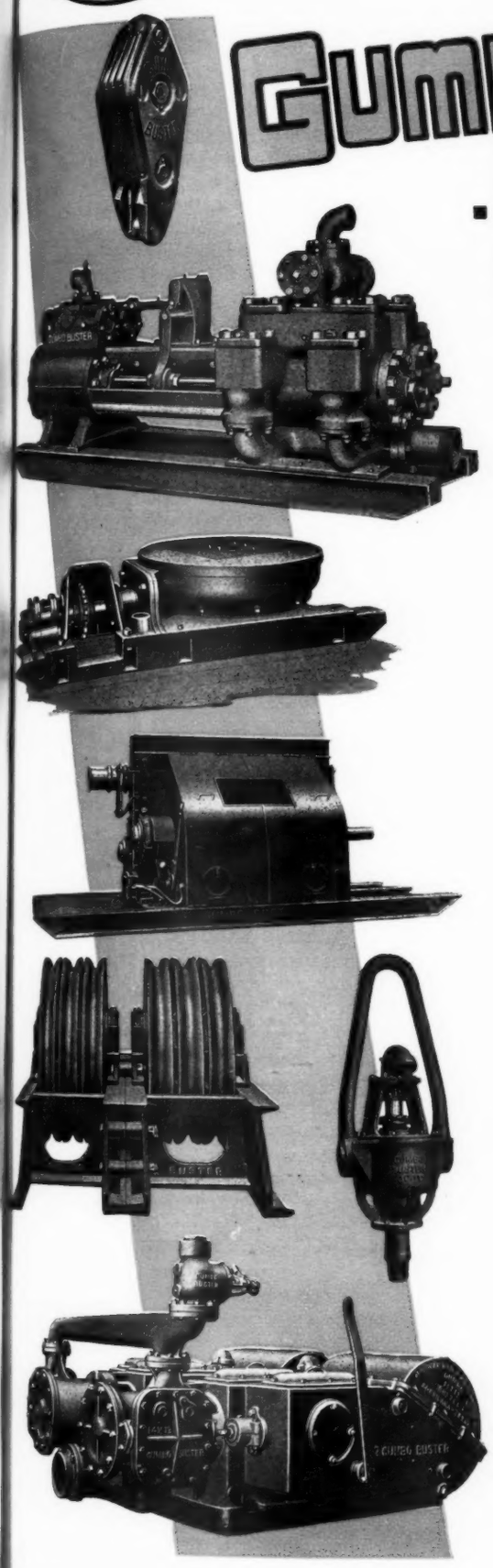
Forecast of domestic gasoline—Demand for first quarter of 1937



BRIDGEPORT

brings a new standard of service for

GUMBO BUSTER (JOHNSTON) .ROTARY MACHINERY



Bridgeport Service means prompt delivery of complete Gumbo Buster units and replacement parts from stocks in or near the active fields of the Mid-Continent and Gulf Coast.

Bridgeport Service includes the unitization of Gumbo Buster machinery with other related equipment for more efficient operation, lower transportation costs and greater convenience.

Bridgeport Service includes field engineering service when needed, assurance of competitive and fair prices, and reasonable terms to fit the requirements of the operator.

For a new standard of service on Gumbo Buster Rotary Machinery, telephone the nearest Bridgeport Representative, Store or Service Office, any hour of the day or night.

GUMBO BUSTER EQUIPMENT

Manufactured by

The American Well & Prospecting Co.
Corsicana, Texas

Distributed By

BRIDGEPORT MACHINE COMPANY
MANUFACTURERS DISTRIBUTORS
OIL DRILLING-FISHING AND PRODUCTION EQUIPMENT

GENERAL OFFICE AND WORKS: WICHITA, KANSAS

Houston . . Dallas . . San Antonio . . Corpus Christi
Shreveport . . Odessa . . Tulsa . . Oklahoma City
Wichita . . New York City . . And Branch Stores

sumption. It seems that the decline in the use of kerosene as an illuminant and heating medium in rural districts and small towns has been offset by increased population and use in tractors. Since kerosene is not so satisfactory as gasoline for tractor fuel, the use of kerosene for plowing is reduced when gasoline prices are low. In foreign countries kerosene is still important as an illuminant, and the demand is well sustained.

Use of Lubricants Growing

Like kerosene, the lubricant demand for domestic consumption and exports is very small compared to the total demand for oil. Domestic demand has grown more rapidly than exports, but foreign shipments, including industrial lubricants, are large, representing about one-third of the total demand.

With the general growth of industry and population and the further expansion of internal-combustion motor operation, the demand for lubricants of course will increase. The best criterion of the future demand for lubricating oils obviously is the growth in the use of the internal-combustion motor. There are no statistics segregating the consumption of lubricating oils by motor vehicles and by the industries, and it is impossible therefore to arrive at a conclusive relationship between internal-combustion lubricant and gasoline requirements.

The motorist now pays more attention to the lubrication of his cylinders and high-speed bearings than during the earlier history of the automobile and changes his oil more frequently, but this probably has been partly offset by improvements in mechanical design that have reduced lubricant consumption. It is estimated that the consumption by passenger cars is one gal. of lubricating oil to about 25 or 30 gal. of gasoline, and according to average experience a car is driven about 500 miles with these quantities of fuel and lubricants. As more attention is given to the keeping of clean fresh oil in crankcases the rate of lubricant consumption will increase. The ratio for trucks and airplanes is about 1:20 gallons.

Since internal-combustion lubricants are companions of motor fuel, seasonal variations and gains or losses may be estimated by the quarterly projection method previously described for gasoline. Since the factors influencing the gasoline demand likewise affect motor lubricants and industrial lubricating oils, data regarding them should be used as a check upon the projected demand figures.

The export trade is important, and as much of it consists of industrial oils, and it fluctuates much less with the seasons than domestic consumption, it should be projected separately and added to the domestic estimate. Foreign economic conditions also should be weighed in this forecast.

Widening Use of Fuel and Gas Oil

In volume the consumption of fuel oil ranks close to gasoline and therefore it is very important in estimating demand. The future outlook for gains in the use of this superior fuel is promising. The principal consumers are steamships and motorships, railroads, the oil industry for power and heat, the manufactured gas and electric plants, and business buildings and homes for heating purposes. The iron and steel plants, smelters and mines, food producers, and miscellaneous industries use some fuel oil for heat and power. There also is a good export trade in fuel oil. The data are inadequate for estimating fuel oil consumption by individual consuming agencies. Satisfactory results, however, may be obtained by lumping total demand and exports, extending a curve for a year with allowance for the general effect of business conditions, and dividing the resulting figures into quarters by means of percentage figures based on past years.

Though not especially prominent and definite, there usually is an upward movement in fuel oil consumption during the cold months and a corresponding decline in the summer that should be considered in estimating. Some types of consumers are not greatly affected by weather. The quarterly plot method suggested for gasoline also may be used.

Several checks should be made upon the figures thus procured. The conditions surrounding each kind of consumer should be considered. Marine demand is governed by international trade and the rate at which new shipping designed to use oil is launched. The price of coal and general economic conditions at home and abroad also should be studied.

Other Forecasting Factors

Wax, coke, and asphalt consumption and exports are comparatively small and vary little from year to year, or seasonally. To make a complete estimate, allowance, of course, must be made for them.

When the estimates of domestic demand and exports have been computed for each product of petroleum by the methods described they may be totalled and the round figure checked by comparison with a projected curve of total demand for the previous several years at the existing rate of increase or decrease. In normal years the estimates and the figures that may be read from the projected curve of total consumption will be close together. Such a comparison, however, would be valueless in an unusual year and at such times little attention should be paid to the trend of total demand.

General Factors of the Supply

Forecasting crude petroleum production calls for the knowledge of the geologist and the petroleum engineer. It is one of the most stubborn problems in oil, for the estimator must weigh human psychology and simultaneously attempt to look both into the future and underground. The problem cannot be solved by pure mathematics, nor, due to the frequent discovery of new fields, is it possible, as imagined by engineers of the old school, to calculate the production solely by the use of decline curves. The best proved method of forecasting consists of a combination of methods. Decline curves are used on fields adapted for this sort of measurement. The new pools, however, must be studied in detail and the success of the estimator will depend upon his geologic and engineering skill and the painstaking care with which he assembles and analyzes his material.

Experience has shown that forecasts for more than 90 days are subject to wide error, but that if confined to this limitation they can be made with a degree of accuracy sufficient for economic purposes.

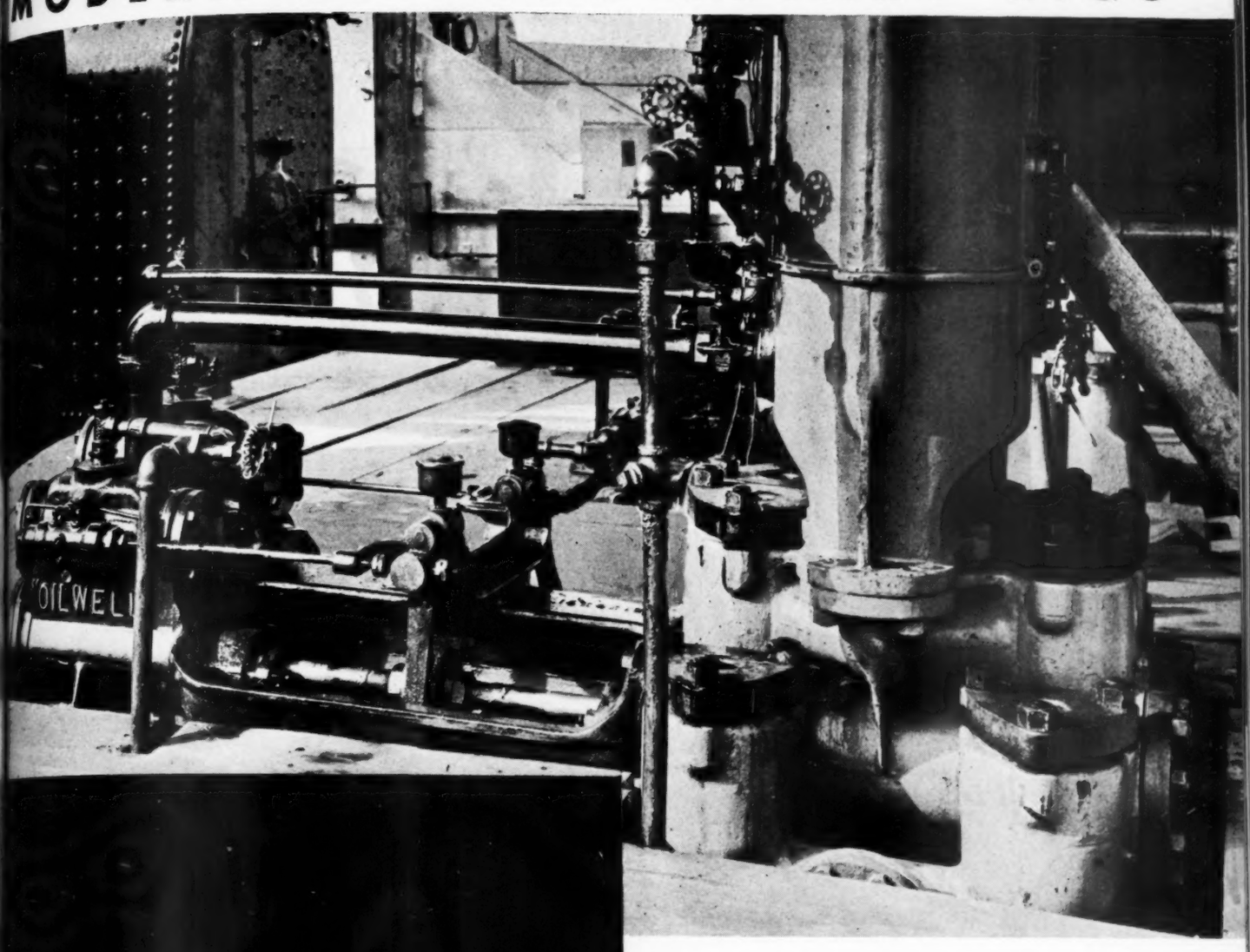
The Detailed Process of Forecasting

The first step in forecasting production lies in the classification of the fields. In order properly to classify the various areas the estimating engineer must be thoroughly familiar with the character of the production. For practical purposes the pools may be classified as follows, and each type separately considered:

1. *Fields that have been defined and developed to the extent that production has long been declining at a relatively slow uniform rate.* In pools of this group the rate of change is sufficiently uniform to permit the use of projected decline curves. Percentage or ratio charts upon which production may be plotted by weeks and extended seem to be the most satisfactory method. The age at which fields enter this class depends upon their character and state of development. In recent years many old pools are being worked over and for this the estimator must make proper allowance.

The newer pools should be estimated separately but in older districts decline curves may be fitted to the combined

MODERNIZE YOUR ROTARY RIGS



Installations like the above are maintaining constant efficiency and are reducing drilling costs in domestic and foreign fields.

PREHEAT your feedwater to about 210° by direct contact with exhaust steam and save 10% to 15% fuel. The condensed steam saves about 15% in feedwater make-up. An added advantage is that the feedwater is conditioned by the removal of scale forming elements and corrosive free oxygen.

Why waste exhaust steam into the air when it can be economically utilized with equipment that pays for itself in a few months? Modernize with "OILWELL" Feedwater Heater-Pump Units.

DIAMOND 1862 OILWELL 1937 JUBILEE

75 years of progress

IL WELL SUPPLY COMPANY

Subsidiary of the United States Steel Corporation

Branch Stores in All Oil Fields

"OILWELL"

production of several pools or an entire district or region having common characteristics.

2. *Flush pools in which development has proceeded to the extent that data are available showing the approximate limits, character and thickness of sand, bottom-hole pressure, drilling rate, initial yield of completions, and rate at which existing wells are declining.* In many instances fields of this class rise with marked rapidity, but due to the limited market for the oil or for other reasons, the production is prorated to a small proportion of the total potential. As soon as sufficient wells have been completed to yield the necessary data production can be estimated with reasonable accuracy, the degree of accuracy depending upon detailed data and study.

Current information of the character described must be kept up to date. The progress of each well that is being drilled must be noted carefully and estimates made of the date, time, and number of probable completions within the period covered by the forecast. Initial production and decline curves based on the performance of adjoining wells are then applied. With the lapse of time fields of class 2 are transferred to class 1.

In recent years drilling curtailment and proration by agreement and order of state and federal bodies have assumed major importance and these factors are entitled to extraordinary attention. Information should be assembled and kept up to date on these subjects and carefully weighed by fields when estimates are made. In pools that are prorated the allowables fixed by state regulatory bodies and recommended by the oil states confederation and the United States Department of the Interior are worthy of careful consideration, but since states sometimes exceed their quotas, the market available for the oil produced in the prorated areas must not be overlooked.

3. *Pools consisting of one well or relatively few wells concerning which there is insufficient information to determine the probable extent, sand thickness, and future drilling program.* This obviously is the most difficult type of production to forecast. Experience in the history of oil production by 90-day periods shows, however, that the yield from pools of this type is a very small percentage of the total. All that can be done is to study carefully all the information concerning the new pool that can be assembled.

In all classes of production careful attention should be given to the opinions and data of geologists and engineers familiar with the specific areas. All production of course is subject to the effect of cost, weather, work-overs, "shooting," deepening, water encroachment, development and production methods, conditions of transportation and storage, company and public policy, and price revisions. Information should be assembled and kept up to date on these subjects and carefully weighed by fields when the estimates are made.

Modern Methods Permit of Estimating Oil Field Yield

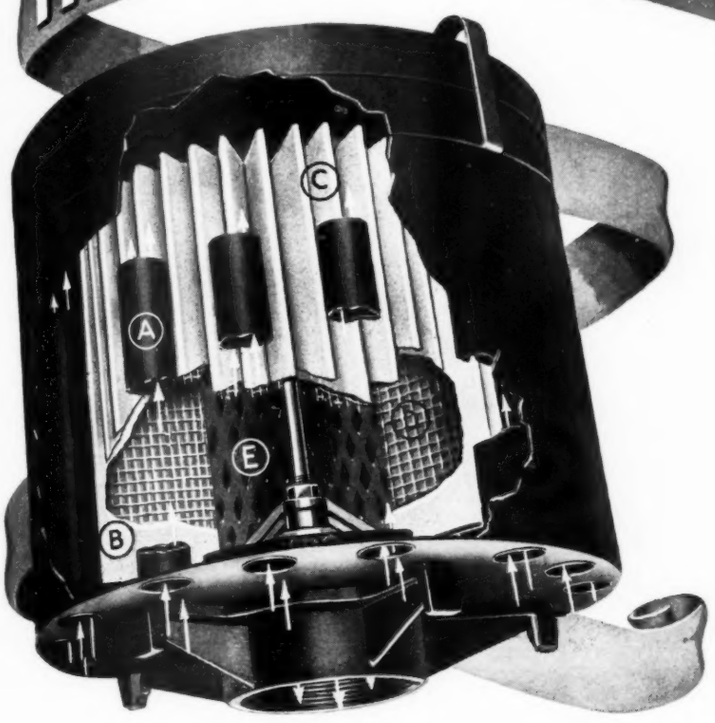
MODERN methods of oil-well drilling and of oil production enable engineers to determine, from the pressure existing more than a mile below the surface, how much an oil field is likely to yield with reasonable exactitude. As a matter of fact, it is a comparatively simple task to estimate the amount of oil in a field, provided exploratory wells have been drilled. Exploratory drilling is no longer a "hit or miss" proposition, for in the last 17 years prospecting has reached a high degree of perfection and much of the guess work has been eliminated, says a release of the American Petroleum Institute.

Geophysical surveying with the seismograph and gravimeter determines the area of the field, improved coring practice in well drilling reveals the thickness of oil-bearing formations, the analysis of well samples tells the percentage of pore space filled with oil. These facts, together with a report on the quantity of oil already extracted, provide sufficient data for a fairly accurate estimate of the field's future yield.

Sometimes, studies of a proven oil field reveal facts about regions in which future reserves may be found. This has been the case in East Texas, a field that has provided plenty of surprises, as well as oil. Experiences in this mammoth field comprise a new chapter in oil-field geology. It was discovered, by accident, in an area previously believed to be lacking in oil. In its development it has confounded previously accepted theories. New geological and other discoveries have tended to become so commonplace that field men working in East Texas have learned to expect the unexpected and to turn it to good use elsewhere.

One unexpected development was the discovery that East Texas oil lay in stratigraphic reservoirs—traps formed by variations in the formation of the strata, instead of beneath domes, or anticlines, that characterize oil deposits in older fields. In earlier searches for oil, domes, anticlines, and faults were carefully noted; stratigraphic reservoirs received scant attention. Today, geologists are inclined to believe that the yield of oil from such reservoirs may be tremendous. These reservoirs, formed by wedges in the layers of rock, or by gradations from sand to shale or limestone somewhat resembling a flight of steps, have been found even on the flanks of domes previously drilled.

THIS AIR FILTER SILENCES!



THE new Protectomotor Model DS is not only the world's finest air filter for internal combustion engines and compressors, but it is an effective *silencer* as well. Consider these advantages: a silencer and filter in one, at little more than the cost of an air filter alone—no additional installation expense—no extra space—but slight extra weight—for silent, as well as dust-free engines!

PROTECTOMOTOR MODEL DS SILENCER-FILTER . . .

A. Cylindrical rectifying chamber. (A series).
B. Dry Feltex Filtering Medium.
C. Circular Fin Construction.
D. Rigid, galvanized mesh frame.
E. Re-inforcing tube.

FAMOUS CIRCULAR FIN CONSTRUCTION

This patented construction is the best form ever devised to resist pulsating intake. It permits a large area of filtering medium to occupy the smallest possible space. Using the exclusive Feltex Filtering Medium, the Model DS is 99.9% efficient against ordinary sized dust particles. *Complete range of sizes from smallest to largest requirements available.*

HERE'S WHAT A USER SAYS

Letter dated January 23, 1937, from the president of the Armstrong Rubber Co., of West Haven, Conn. He Writes: *"We installed an air compressor which developed a noisy intake . . . this became intolerable to neighbors . . . in night operation. We then installed your Silencer type of filter . . . the improvement was instant, and, we think, remarkable, enabling us to work nights without complaint." (Signed) J. A. Walsh, President.*

PROTECTOMOTOR
REG. U.S. PAT. OFF.
99 9/10 Per Cent EFFICIENT
AIR FILTERS

STAYNEW FILTER CORP.
2 Leighton Avenue, Rochester, N. Y.

SOLVES NOISE *AND* DUST PROBLEMS WITH *ONE* FILTER

First gauge, on the Christmas tree, showing a pressure of 3700 pounds

Drilling the World's Second Deepest Producing Well

By DENIS S. SNEIGR

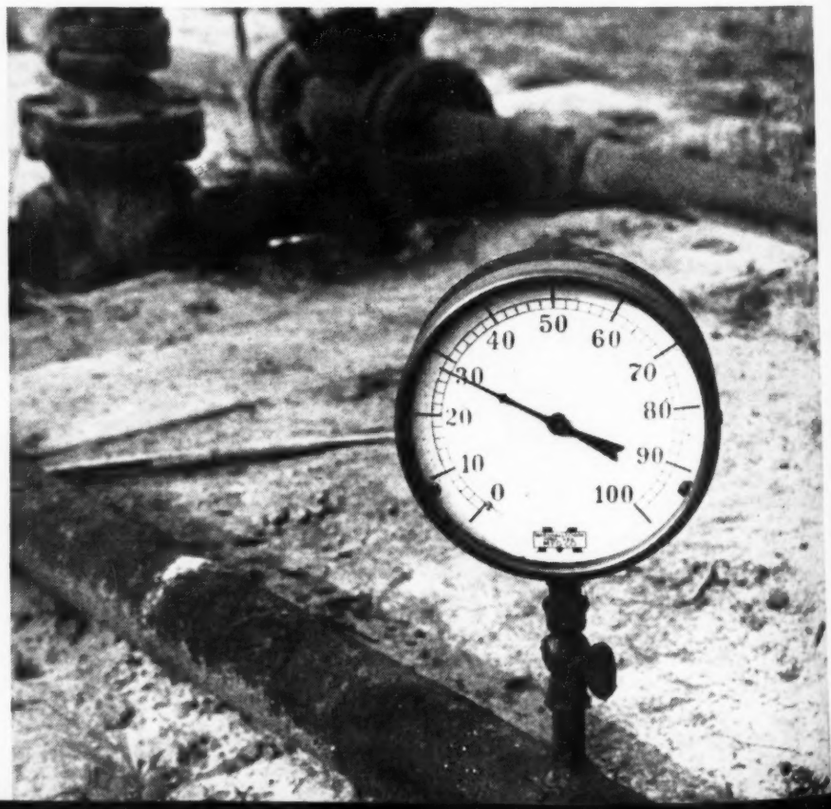
In addition to overcoming numerous difficulties encountered in completing a well at a depth of 10,437 ft., high gas pressure presented a production problem that was solved by an original flow line hook-up

ON February 28, the world's second deepest commercial producer was completed at a total depth of 10,437 feet. Because of the high gas pressure, this well, the Abercrombie, Harrison & Atlatl Company's No. 3, Bernard River Land Development Company in the Old Ocean field, Brazoria County, Texas, presented an unusual production problem that the operators have solved successfully by an original flow line hook-up.

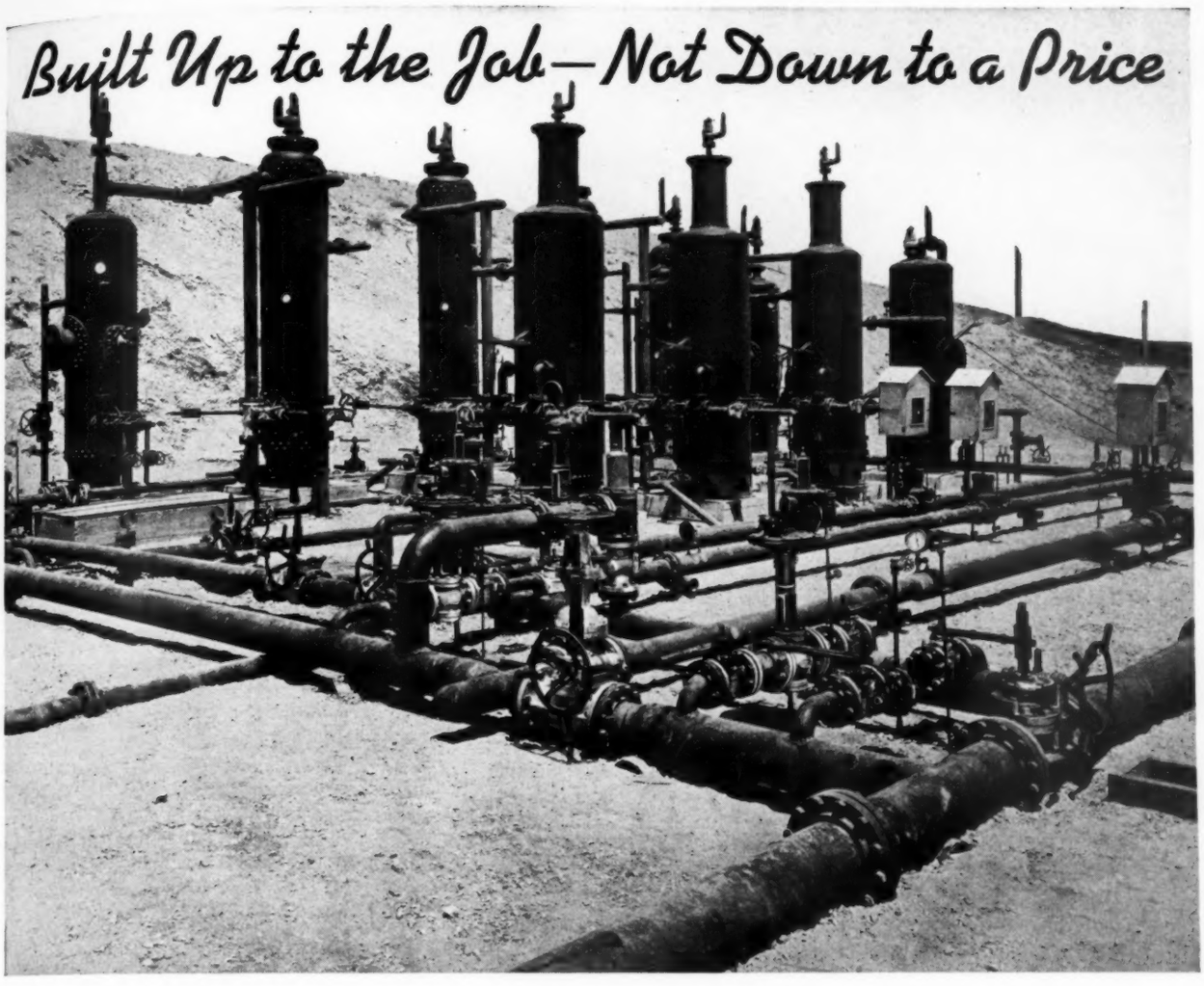
Spudded November 10, 1936, the well was drilled to 9000 ft. with no difficulties. The casing program was as follows:

Depth	Casing	Cement
44 ft.	20-in.	
1,268 ft.	13⅜-in.	
6,070 ft.	9⅝-in.	300 sacks
10,004 ft.	7 -in.	400 sacks

6⅝-in. hole from 10,004 ft. to 10,437 feet.



Last gauge, on the line leading to the flare, shows a pressure of only 28 pounds



SO MASONEILAN REGULATORS COST LESS

Regulators that give dependable, trouble-free service year after year are the true "bargains" because they cost less in the long run. For every day a regulator is out of service is part of its cost.

Correct design, rugged construction, highest quality materials, precision workmanship and thorough testing insure Masoneilan equipment staying in the line and out of the repair shop.

Specify Masoneilan regulators—the equipment that costs less in the long run—for gas, oil, water, air or steam service. Write your requirements to our office nearest you.

MASONEILAN

MASON-NEILAN REGULATOR COMPANY, 1193 ADAMS STREET, BOSTON, MASS., U. S. A.

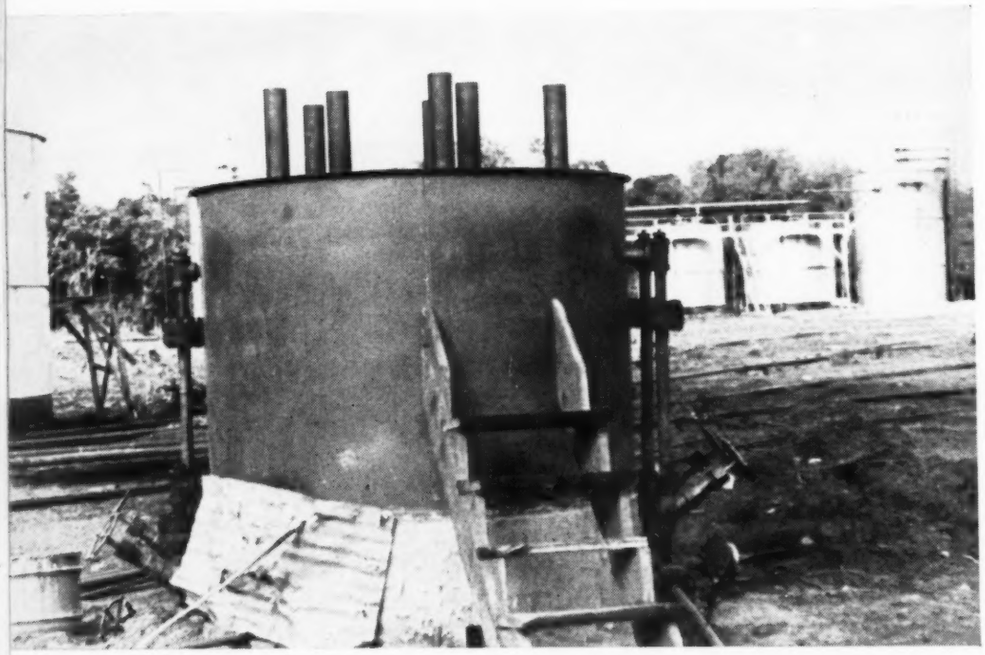
New York Philadelphia Pittsburgh Chicago Tulsa St. Louis Houston Los Angeles

General view of well-head connections

At about 9000 ft. the gas pressure began to increase and to control the gas a mud weighing 11.5 lb. per gal. was employed. This mud, viscosity 32, was employed successfully to control the gas, but when circulation was stopped the mud tended to settle out in the bottom of the hole. The application of a gel material to the mud would have corrected the settling condition, but also it would have altered the viscosity of the mud and perhaps led to trouble with the gas.

Rather than run this risk, the operators decided to let the mud remain as it was and if necessary re-drill the section of hole at the bottom that had filled.

Under these conditions the well was drilled to its total depth of 10,437 feet. Frio sand 30 ft. in thickness was found to lie between 10,263 ft. and 10,293 feet. Knowing that some mud had settled on bottom and expecting trouble from this source, the operators decided to set 51 ft. 8 in. of 4½-in. stainless steel slotted screen in order to make certain that the entire section of sand exposed in the hole was covered.

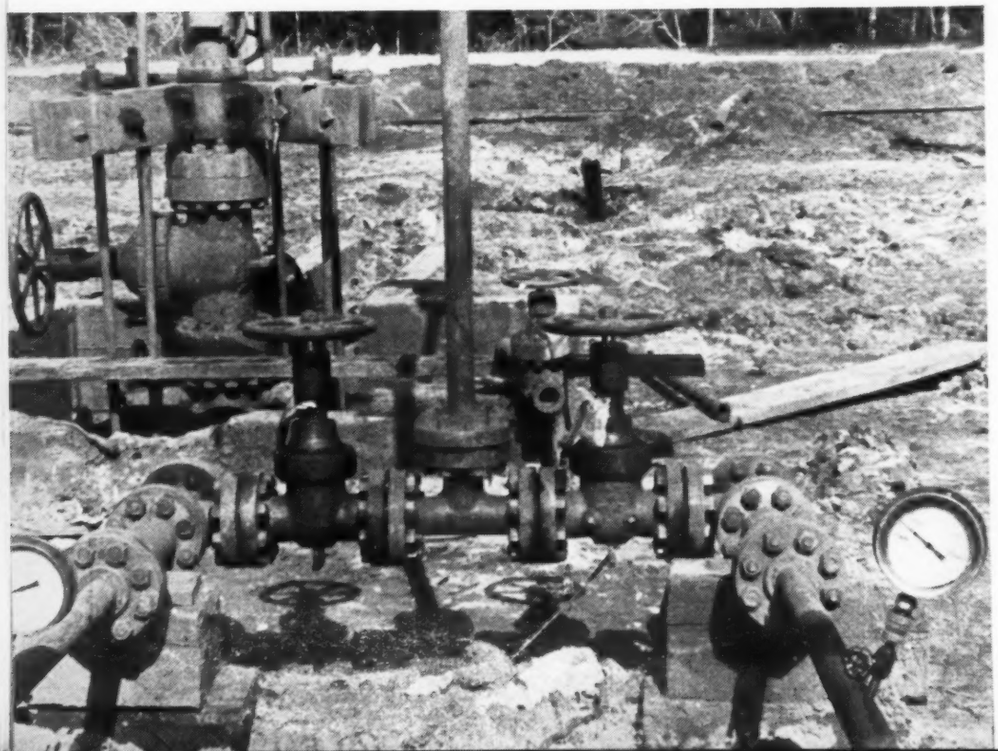


The heater on the flow line between the well and the separators

First, 124 ft. 3 in. of 4½-in. blank liner and a set shoe were run in on bottom of the screen. This was landed at 10,424 feet. On top of the screen was set and sealed 339 ft. of 5-in. flush joint and a packer 9 ft. 10 in. long. With the 3-in. drill stem, a 2-in. wash pipe on the setting tool was run down inside the screen and liner. Through the 2-in. wash pipe, a 500-ft. column of wash water was circulated behind the screen. Following this, the setting tool and the 2-in. wash pipe were pulled out of the hole, leaving the packer, the screen, and the liner in the hole.

The operators then went back in the hole with 9838 ft. 11 in. of 2½-in. upset tubing with a packer 11 ft. 4 in. long on the bottom. Connected to the setting tool, 504 ft. of wash pipe was run down through the lower packer and inside the screen.

The 11-ft. 4-in. packer was run to 9860 ft., at which point it stuck. The



View showing details of the connections on the tee leading from the side of the Christmas tree

Synonymous with safety...

THE ALL-ELECTRIC OPERATION of Lane-Wells Gun Perforators is every well operator's guarantee of safety. 7000 successful jobs have proven it safer than any combined mechanical and percussion method. Every Lane-Wells perforation job is handled by our trained crew. Buzzers, lights and two-way public address systems have made premature firing impossible. Lane-Wells gun loads are impervious to percussion and last but not least the safety set-up is completed by full liability insurance on life and property.

THE **LANE-WELLS** CO.

Gun Perforator Service

"TOMORROW'S TOOLS TODAY"

LOS ANGELES, CALIFORNIA • NEW YORK CITY, NEW YORK

THE LANE-WELLS CO. OF TEXAS—HOUSTON & CORPUS CHRISTI • THE LANE-WELLS CO. OF OKLAHOMA—OKLAHOMA CITY & TULSA

The oil and gas separators

Fittings on the line leading from the separators to the flare

intention had been to set it on top of the lower packer, but when it stuck at 9860 ft., leaving 39 ft. between the upper packer and the lower packer, it was decided to leave it there.

Tubing, 2½-in., was set on top of the blowout preventer rams, the Christmas tree of 6000-lb. test connected above the blowout preventer, and the well washed through the Christmas tree. In approximately two hours the well began to flow under 3350-lb. gas pressure. Within several days the pressure had built up to 3900 lb. but since has dropped to 3700 pounds.

After testing tentative choke and flow line arrangements, the operators have found that the double choke hook-up now in use best meets the production conditions at the No. 3 Bernard River Land Development Company.

The present arrangement of chokes and flow lines consists of three lead lines from the Christmas tree to the flow line and a series of six chokes between the flow line and the Christmas tree. On each side of the Christmas tree a 2-in. line is connected. One of these lines runs directly to the main flow line. On the other side of the Christmas tree, the 2-in. line is divided by a tee, splitting the flow two ways. From the tee, these two lines connect to the main flow line. Thus, the well can be flowed through any one or all three of these outlets to the flow line.

On each wing of the Christmas tree a choke reduces the 3700-lb. pressure to 2700 pounds. On the tee there are two chokes, one on each side, which reduce the pressure from 2700 lb. to 800 pounds. Immediately before the two lines from the tee enter the main flow line there are two more chokes, one on each line, that reduce the pressure from 800 lb. to 500 pounds.

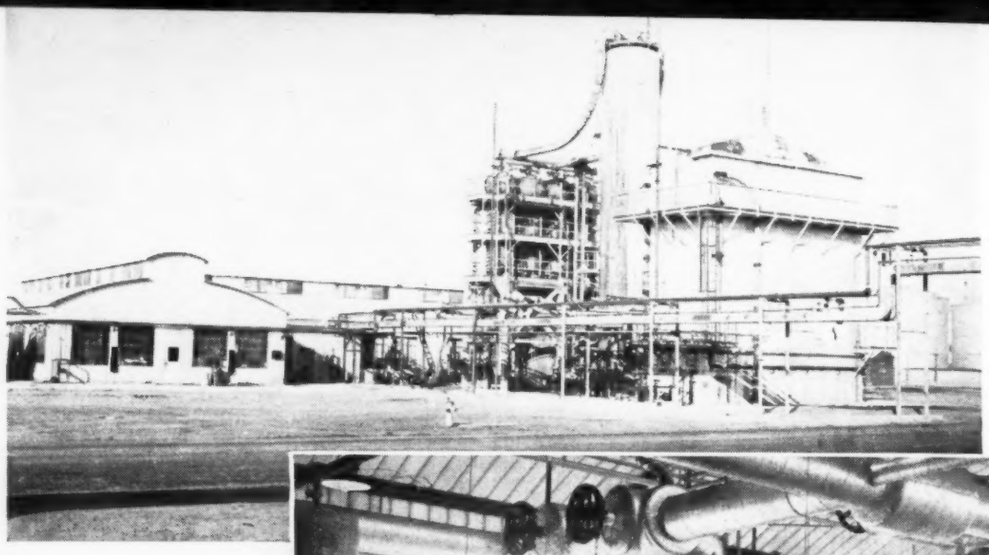
About one-half mile from the well the flow line passes through a hot water heater. Some 400 ft. from the heater are the two separators, one of 500-lb. and the other of 1000-lb. working pressure, either or both of which may be used. On the other side of the separators a series of chokes and regulators further reduce the pressure.

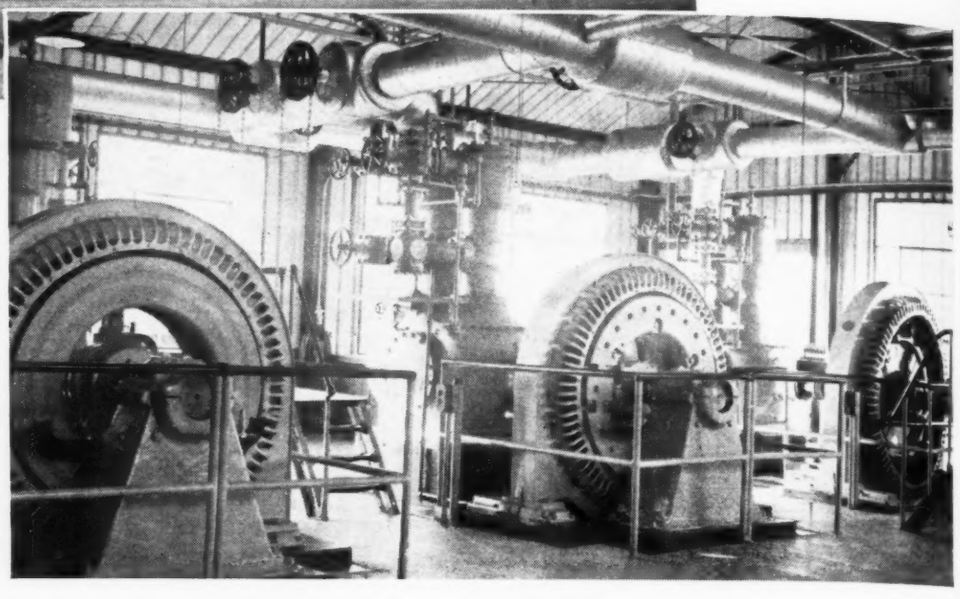
The heater mentioned consists of a gas burner beneath a 50-bbl. water tank in which is a series of coils. The flow of the well passes through the coils in the heated water. Only a slight rise in temperature is necessary to prevent freezing, and since the arrival of warm weather no trouble has been experienced.

During the drilling of the No. 3 Bernard River Land Development Company, Abercrombie & Harrison employed in the Christmas tree an unusual safety device, which was installed beside the derrick on the mud line. From one wing of this Christmas tree a line ran to a de-gassing tower where the mud could be freed of gas and flowed back to the slush pits. From the other wing of the Christmas tree a line ran to the pits.

In the drilling of this well, the operators observed every safety precaution, including the use of the heaviest drilling equipment available. Unusually careful attention was given to the drilling mud, and also to the use of the de-gassing tower mentioned.

MITH-WELDED AND SMITH-LINE





Above: Wilshire Oil Company's treating plant and re-run unit at Santa Fe Springs, California

Right: Interior of the refrigeration building, showing part of the equipment installed, consisting of synchronous motors and ammonia compressors

Treating Cracked Gasoline Containing Sulphur

By
J. C. ALBRIGHT

Details of acid-treating plant installed by the Wilshire Oil Company, Inc., at Santa Fe Springs, California, to provide a marketable product

WHEN Wilshire Oil Company, Inc., made its final decision in February, 1935, to build the 12,500-bbl. combination skimming and cracking unit, to be erected on its property near the large tank farm at Santa Fe Springs, California, the problem of treating the cracked gasoline presented itself. Accustomed to handling a straight-run product for many years, manufactured in its 20,000-bbl. skimming plant in Vernon, the company did not, however, have first-hand experience in treating cracked gasoline produced from Los Angeles Basin crude.

All pressure distillate manufactured from oil produced in the Los Angeles Basin, as well as from other sections of the state, contains a very high percentage of sulphur and undesirable compounds. To make a decision on the type of treating plant to use, Wilshire was faced, as all other California refiners have been, with the necessity of reducing the sulphur to a value that would permit the finished, rerun product to compete with other brands of gasoline manufactured in Southern California when placed upon the market, domestic as well as export. Raw "400" cracked gasoline, taken from the overhead streams of plants charged with topped crude or fuel oil contains as much as .63 percent sulphur, which must be reduced considerably, the percentage of reduction depending somewhat upon the points of marketing, as well as other factors.

Numerous California refiners who are operating cracking plants in the Los Angeles Basin are following a practice of using a topped crude, or fuel oil, as the case may be, as a charge to their plants, and have been treating cracked gasoline manufactured from this type charging stock with sulphuric acid. Preliminary investigation of this problem, made by following samples of cracked gasoline through the research and analytical laboratories, indicated that Wilshire could utilize with satisfactory results a treatment involving sulphuric acid. Results obtained in the completed plant would depend largely upon the temperature of the gasoline and the acid at the instant of contact, and the thoroughness of removal of the sludge from the treated gasoline. The time factor involved while treating previously had been discovered to be very important when using a 98-percent sulphuric acid, and that the separation of the sludge should be accomplished quite early in the treating cycle, because of the deleterious effect it had upon the distillate. It had been found that when a deep layer of sludge was left remaining in the settling tanks, and was accompanied by a steadily rising temperature, unfavorable side reactions would occur. Sulphur dioxides were found to be liberated, which, when reacting with

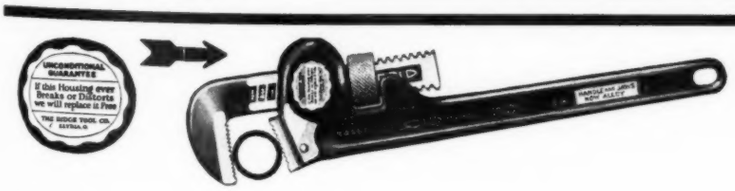
1 SET OF DIES threads 4 sizes of pipe

Instead of 16 separate dies usually needed to thread 1", 1¼", 1½" and 2" pipe, this RIDGID No. 65R threader threads them all perfectly with one set of 4 dies, that stay in the threaders, can't get lost.

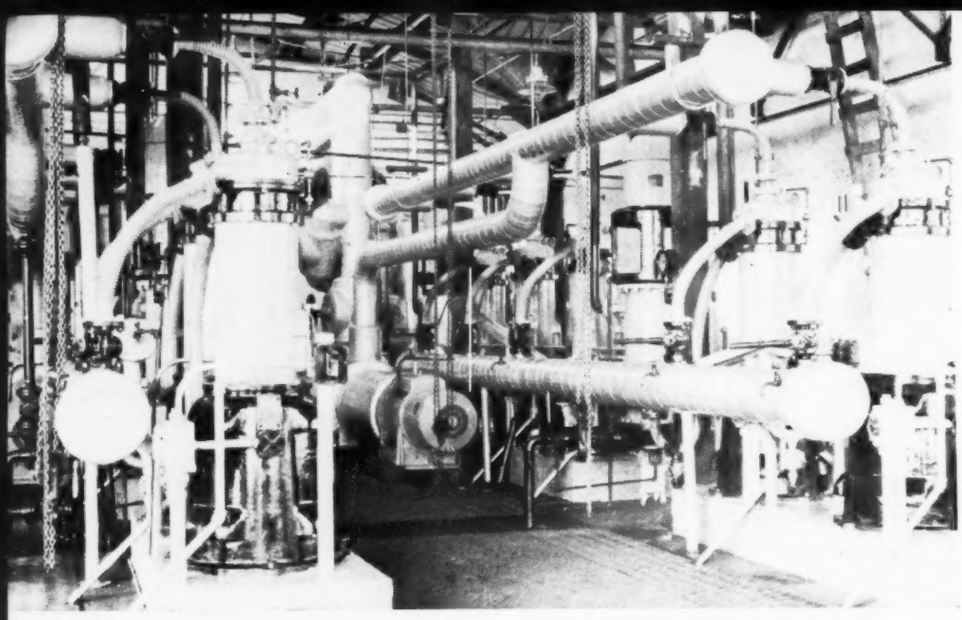
Move the change plate to the size of pipe and the threader is ready for work. Even the new style workholder sets to size with a twist of a gauge ring — put it on the pipe and tighten with one screw.

You'll like these and other features of this remarkable tool. Ask your Supply Store to show you a RIDGID No. 65R.

THE RIDGE TOOL CO. **RIDGID PIPE TOOLS** ELYRIA OHIO, U.S.A.



75% of your wrench repairs are stopped when you use RIDGIDs with the unconditionally guaranteed housing.



Interior of the acid-treating building showing centrifuges and contactor in lower background

the pressure distillate above the sludge layer, produced sulphuric esters that were almost impossible to remove.

The first plans for treating the distillate included a conventional sulphuric acid treating plant, utilizing settlers, agitators, and the like, all without the positive control of temperature. Final investigations of the problem in the laboratory was a deciding factor in the purchase of a treating plant that contained facilities for positive dispersion of the acid into the distillate, and almost instantaneous removal of the sludge resulting from the contact. Positive, motor-driven, mechanical refrigerator-contactors were involved, as well as centrifuges for the separation of the pressure distillate from the spent acid after contacting. With an expected manufacture of approximately 5000 bbl. of pressure distillate each day the plant was operated, the treating unit was to be sufficient in size that this volume easily could be passed through the equipment.

The treating unit as finally installed contains controlled temperature, positive dispersion, de-sludging, and three stages of treating; the first being with twice-used acid, and the last with fresh acid from the automatic blow-cases. To accomplish the results desired, the treating plant was constructed so it contained several distinct features: first, refrigeration; second, contacting; third, sludge separation; fourth, soda neutralization; fifth, re-running; sixth, final doctor treating.

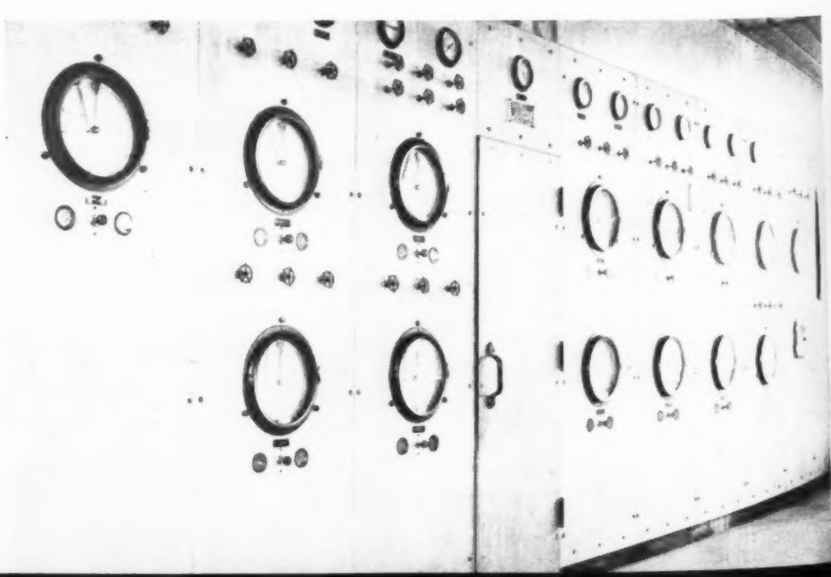
The temperature-controlling part of the treating unit includes compression and expansion ammonia refrigeration machinery driven by synchronous motors. The contacting units were designed to produce homogeneous mixtures by the expenditure of relatively large amounts of energy per unit of time, comparatively small quantities of liquids undergoing mixing, while offering low pressure drop between the inlet and discharge of the machines themselves. In these contactors there is a zone of high turbulence established between the stationary shearing blades and the blades of the screw impeller on the inlet side. As the liquids pass through the impeller, their flow is greatly accelerated, and when the liquids leave the impeller on the discharge side, the stream, slightly swirling, encounters diffuser vanes by which it is changed to turbulent flow. The direction is then reversed at the bottom of the contactor, and the stream continues its flow at high velocity in a closed circuit through an annular space provided with anti-whirl vanes. Since the liquids—acid-sludge, fresh acid, and pressure distillate—enter a flowing stream at many times the flow rate of the charge, cross circuiting is eliminated by the peculiar arrangement of vanes and impellers.

Sludge separation, or the removal of the treating acid from the pressure distillate, is accomplished in specially-designed centrifuges, set in rows in the treating building, one row for each treating stage. The first stage of contact between the fresh untreated distillate and the acid, is in the third stage for the acid itself, as chemicals used at this point are taken from the second contact as partially spent acid, or sludge. The centrifuges take the chilled, or refrigerated, acid and pressure distillate in at the top of the machines, in the conventional centrifuge manner, each machine having two outlets on the side of the separating-bowl case through which the pressure distillate and acid sludge pass, separated, of course, and flow into their respective headers.

The inlet header is in the aisle between the rows of centrifuges, suspended from the roof trusses of the building, with feeder lines opposite each centrifuge. The outlet line for the pressure distillate is supported upon pipe racks below the inlet header and slightly nearer the machines, while the acid sludge line lies lower and nearest the centrifuges. All connecting lines are of special flexible hose, with corrosion-proof lubricated plug valves to control the flow, or to cut out any unit that may be in need of adjustment or repair, thus preventing interruption of the flow of pressure distillate through the plant.

Soda neutralizers are used along similar lines as the acid-pressure distillate contactors, with the acid-treated gasoline entering the soda solution. Spent soda is used in the first contactor, and freshly made, or unused, in the second machine; two machines being utilized for this treatment. Settling tanks and water-wash vessels are involved in this phase of treating in order to remove thoroughly all traces of acid and neutralizing agent before the treated gasoline enters the rundown tanks or is pumped to the re-run unit. Suitable blow-cases have been installed for both the acid and soda solution, each being equipped with flow regulators to govern the amount of chemicals released to the contactors.

Re-running of the acid-treated,



Part of the instrument panel in the acid-treating and re-run unit

OKLAHOMA HONORS A FAMOUS INDIAN...

The Cherokee Alphabet

Beginning in 1809, it took Sequoyah 12 years of continuous labor to develop his Cherokee alphabet. It consists of more than 80 characters or letters—one for each syllable in the Cherokee language.

Experts agree that Sequoyah made the simplest and most perfect alphabet in the world. After learning the alphabet it is impossible to misspell any word in the Cherokee language! This is because every word is spelled exactly as it sounds.

While introducing his alphabet to the Cherokees, Sequoyah spent 20 years in Indian Territory, now comprising Oklahoma. His invention proved of great educational value to his people, enabling them to read and write for the first time in their history.

And Appreciates a GREAT WIRE LINE !

One way for a state to honor its famous men is to place their statues in the National Statuary Hall at Washington. Here, Oklahoma has placed a statue of Sequoyah, the famous inventor of the Cherokee alphabet. In this way, Oklahoma pays its respect to one of America's most illustrious Indians.

Oklahomans are quick to appreciate real merit. That explains why Oklahoma oil men are so enthusiastic about UNION Wire Lines. They have found that UNION Lines are always dependable, always give economical service.

The photograph shows Indian Territory Illuminating Oil Company's A. Wisel, Well No. 4, at Oklahoma City. The men in the front row, left to right, are: L. P. Nixon, Union Wire Rope Corp.; Ed Rankin, Jarecki Mfg. Co.; Bob James, drilling sup't., Indian Territory Illuminating Oil Co.; Cecil Carpenter, Jarecki Mfg. Co. In the back row are: Vern Pember, driller; M. L. McCullough, tool dresser.

UNION WIRE ROPE CORPORATION

Oil Country Sales Offices: 601 Beacon Bldg., Tulsa, Okla.
General Office and Factory: Kansas City, Mo.; Branch: Portland, Ore.; Warehouse: Monahans, Texas

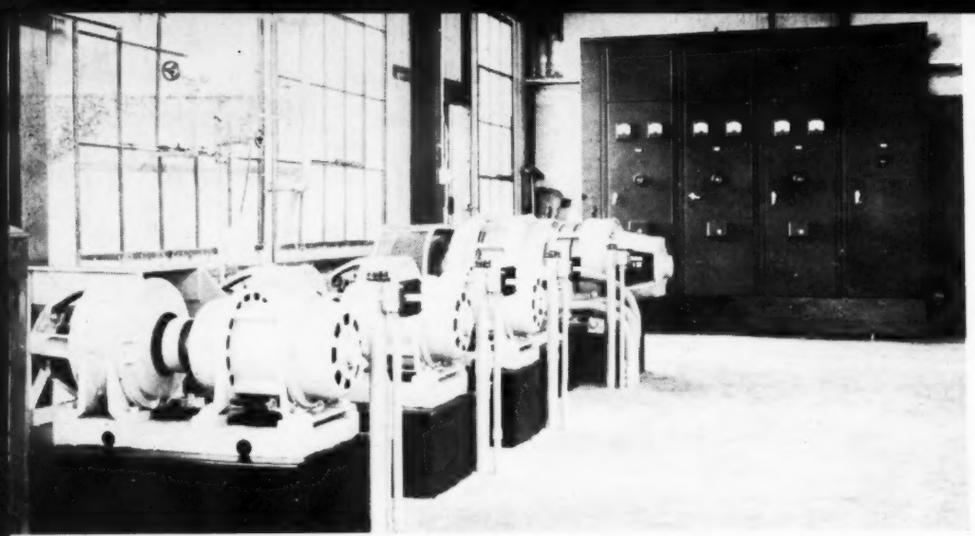
In Mexico:
E. O. CHAPA
P. O. Box 604
Tampico, Tamps.
Mexico, Stocks at Tampico

JARECKI MFG. CO.
Distributors: Midcontinent, New Mexico and Eastern Oil Fields
MARION MACHINE FOUNDRY & SUPPLY CO.
Rocky Mountain Fields, except New Mexico

Export Agents:
(except Mexico)
LUCEY EXPORT CORP.
Woolworth Bldg.,
New York; Broad St. House, London

UNION WIRE LINES

The "ULTIMATE LOW COST WIRE ROPE"



Frequency changers and control panel —part of the electrical equipment in the treating plant

soda-neutralized pressure distillate is accomplished in a more or less conventional pipe still, with fractionating column, heat exchangers, charging pumps, and reflux pumps. The charge is picked up by the charging pumps, taking suction from the rundown battery, or, from the working tanks at the acid-treating unit. Doctor-treating also is accomplished in a more or less conventional set-up, employing horizontal tankage, pumps, and other necessary mechanical equipment employed at the average doctor treater.

In operation, the treating plant, including all steps necessary to provide a marketable cracked gasoline, takes the distillate from the cracking plant run-down battery consisting of eighteen 5000-bbl. welded all-steel tanks and handles it by successive steps until it is ready to be transferred to the blending station in Vernon, or shipped otherwise to ultimate market.

With a production of approximately 5000 bbl. of pressure distillate daily, the rate of flow to the acid plant is approximately 150 gal. per minute. The distillate is strained to remove all foreign matter, metered, and controlled with respect to volume. Prior to entering the contacting equipment or the refrigeration machinery, the untreated stream flows through a long-tube, floating-head type heat exchanger, to be cooled by the counter flow of acid-treated gasoline, so that refrigeration will be conserved to that extent.

As the process of treating includes three stages, pressure distillate passes through three chillers, one set for each stage. Ammonia flows over the tubes in the chiller at the required rate to obtain the desired temperature in the charge before it enters the contactor, which in the first stage of contacting is approximately 30 deg. fahrenheit. Temperatures on the outlet of the contactor, on the distillate side, govern the degree of refrigeration required, by actuating an anti-ambi temperature regulator — range 0 deg. to 60 deg. fahrenheit—the bulb of which is set in the piping leading from the contactor. If more refrigeration is required than that provided at the moment, this temperature-controlling valve permits a greater volume of ammonia to flow to the chiller, but maintains without manual control the temperature necessary for treating, once the plant has been placed in equilibrium.

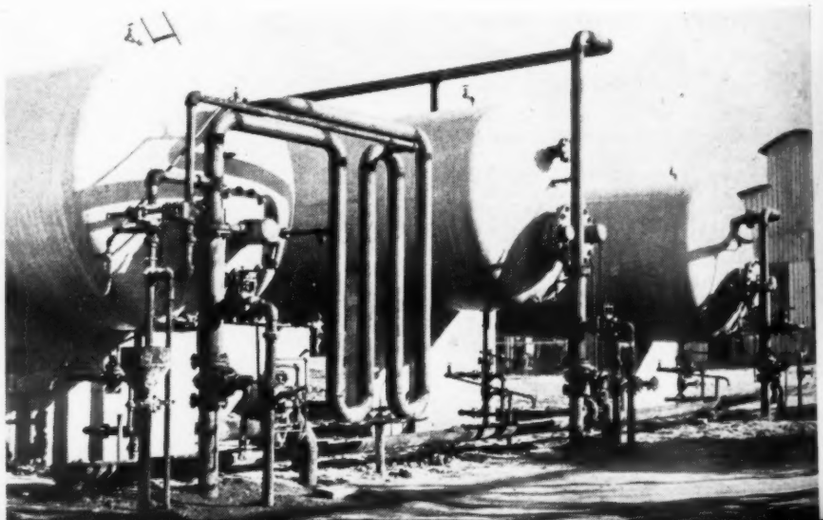
The essential parts of the refrigeration unit consists of three ammonia compressors, one of which is driven by a 250-hp. motor, the remaining two each having a 175-hp. motor. Sufficient space has been provided in this part of the building so that additional equipment may be installed in the future, should lower temperatures be required for some phase of treating, or the refinery as a whole be enlarged so that more pressure distillate will be manufactured.

The time element in contacting the pressure distillate with the partially spent acid, sludge, or fresh chemicals is remarkably short, as it requires only about one second to accomplish complete dispersal of the acid into the distillate and discharge the liquids into the header leading to the centrifuges. As the lines between the contactors and the centrifuge battery purposely are extremely short, the time consumed by the liquids traveling from the contactor to the outlets of the centrifuges is approximately four seconds, which includes the time necessary for separation of the chemical from the gasoline.

In the second and third contact between the pressure distillate and the chemical, the flow is similar to the first, except that fresh acid is used for the third contact with the distillate. Counter flow is utilized in this system, the fresh acid traveling against the distillate, becoming sludge, or partially spent acid, in the successive steps. Connections were made, however, in the various units of the treating plant so that, if necessary, fresh acid may be injected into the stream of sludge to produce the desired quality of treating, should the distillate become difficult to handle. The temperatures, too, are changed in the various contacts, becoming successively lower in each battery, until at the third machine, the temperatures have been reduced to an average of 20 deg. fahrenheit.

The distillate is water-washed to remove excess acid before it is passed to the soda neutralizers, preventing excessive costs arising from the consumption of larger quantities of soda. Contactors are utilized for mixing intimately the soda solution and the distillate, and are similar in design to those used in the acid phase of treating, employing counter-current flow of soda and two stages of contact. Spent soda used to contact the acid-treated distillate flows from the centrifuge outlet to ultimate disposal, and the fresh soda contacts the distillate in the second set of contactors. Likewise, acid sludge, after being used in the first contact with distillate, flows to disposal lines and is neither reclaimed nor renovated for further utilization.

After being water-washed to remove the last trace of chemicals used in treating, the pressure distillate is packed up from working storage, or plant tanks, as the case may be, by one of two centrifugal pumps, which are driven by



Doctor-treating tanks and contactors

Look to the Pioneers for Continued Leadership

THE **A. B. C.** OF FIRING OIL FIELD BOILERS
THE **N. G. E.**-NELSON SERIES 1000 GAS BURNER

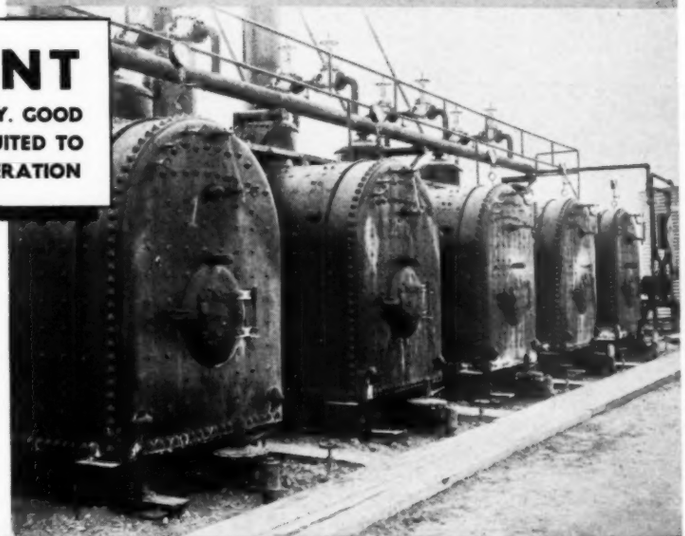
IT'S PORTABLE

INSTALLED IN 45 MINUTES. EASILY REMOVED AND REINSTALLED WHEN CHANGING BOILER LOCATIONS ...REQUIRES NO FIREBRICK COMBUSTION CHAMBER

The design of the N.G.E.-Nelson Series 1000 Gas Burner incorporates every consideration for safety, capacity, boiler maintenance, economy of operation, and long service life. The ease and time with which this burner can be installed is outstanding: only 45 minutes is required for the average installation. The whole installation is quickly and easily made, requiring no combustion chamber and a minimum of pipe connections. By requiring no firebrick combustion chamber, brickwork or masonry, or alterations to the boiler, ready removal and reinstallation can be effected if locations are to be changed.

IT'S PERMANENT

RUGGEDLY CONSTRUCTED FOR HEAVY DUTY. GOOD FOR YEARS OF SATISFACTORY SERVICE. SUITED TO ALL BOILER INSTALLATIONS WITHOUT ALTERATION



The N.G.E.-Nelson Series 1000 Gas Burner consists essentially of a heavy-sheet steel box in which is placed the gas header, burner manifolds, burners and radiant refractories. Its utilization of the principle of radiant heat transmission to the fullest extent brings to the oil field boiler plant the application of heat used so effectively in large central station plants. Apparent to engineers will be the fact that incandescent heat affords maximum BTU release per cubic foot of combustion space, greatest acceleration in the rate of firing, and operation with less stack draft. Even uniform firebox temperatures are maintained at all times. Your request for a new descriptive bulletin will receive prompt attention.

NATURAL GAS EQUIPMENT CO. OF TEXAS
811 STERLING BLDG. HOUSTON, TEXAS

Mid-Continent Distributors:
HOUSTON OIL FIELD MATERIAL CO. HOUSTON, TEXAS
WEBSTER ENGINEERING COMPANY TULSA, OKLAHOMA
Natural Gas Equipment, Inc. — Los Angeles, San Francisco, California

steam turbines, and delivered to the rerun pipe still. The distillate, after being water-washed, has a consistently low temperature, averaging about 55 deg. fahr., and to conserve both fuel and cooling water heat exchangers are employed. The feed, before it enters the pipe still, passes through exchangers counter-current to column vapors and what bottoms are produced as polymers from the rerun unit.

a pressure of approximately 18 lb. the distillate is split in two streams, one leaving the top of the tower as material for condensation into finished gasoline, and the residue, or bottoms, being polymers, is withdrawn and passed through the charge-to-bottoms exchanger and to storage as material to be used in the cracking plant, or disposed of in another manner.

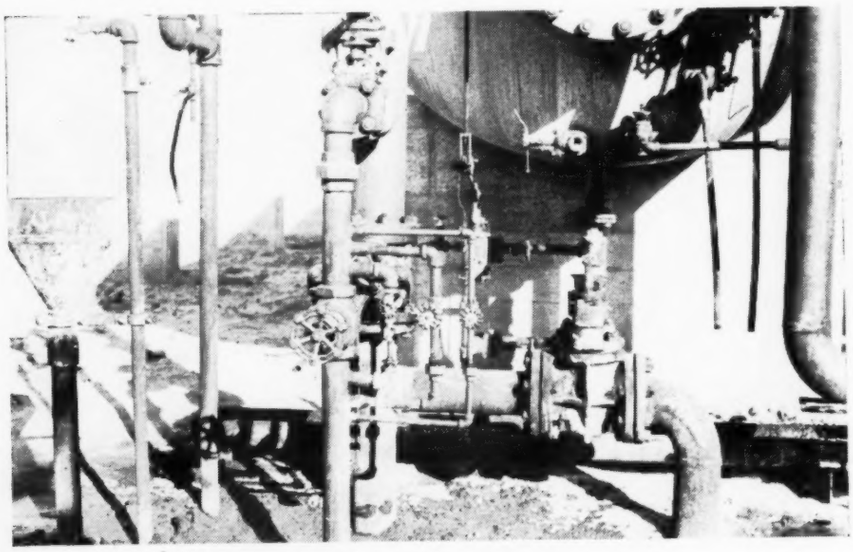
The top of the fractionating column

approximately 225 deg. fahr to approximately 300 deg. fahrenheit.

After the gasoline has been condensed and cooled, it passes to the usual type of rundown tankage, and from there to storage or to the doctor-sweetening plant. In either instance, reciprocating pumps handle it, and when being passed through the doctor plant it is contacted outside the vessels in special mixers and the solution proportioned to the distillate according to the condition of the gasoline and the compounds to be removed. The amount of doctor solution flowing into the gasoline stream is regulated, or adjusted, by a manifold of several small pipes with valves so that any combination may be used from the smallest to the largest flow.

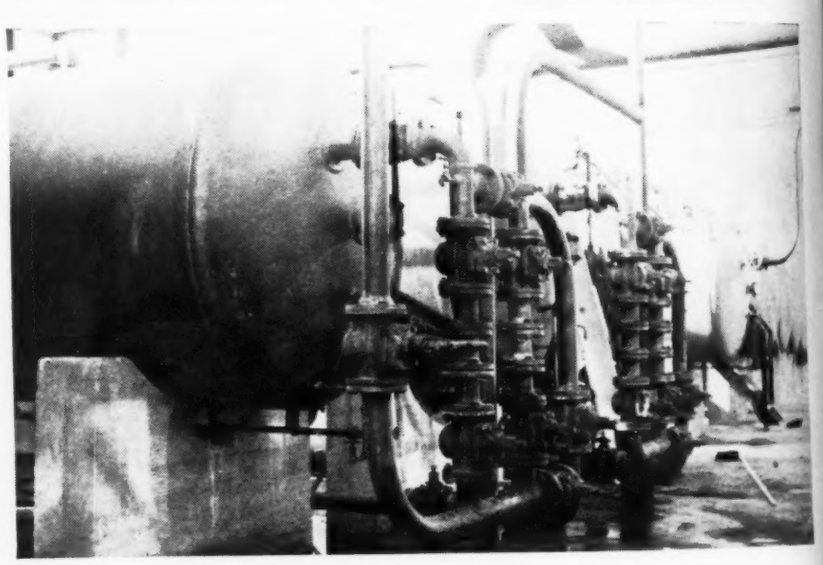
Average results on pressure distillate are as follows:

Sulphur, Raw 390° F. E. P. pressure distillate	0.63%
Sulphur, finished gasoline	0.18%
Acid rate, lb. per 42-gal. bbl.	13.6



Above: Doctor-feeding manifold in the treating plant

Below: View of acid storage tanks showing valves and piping. Tanks and connections are of special metal resistant to acid corrosion



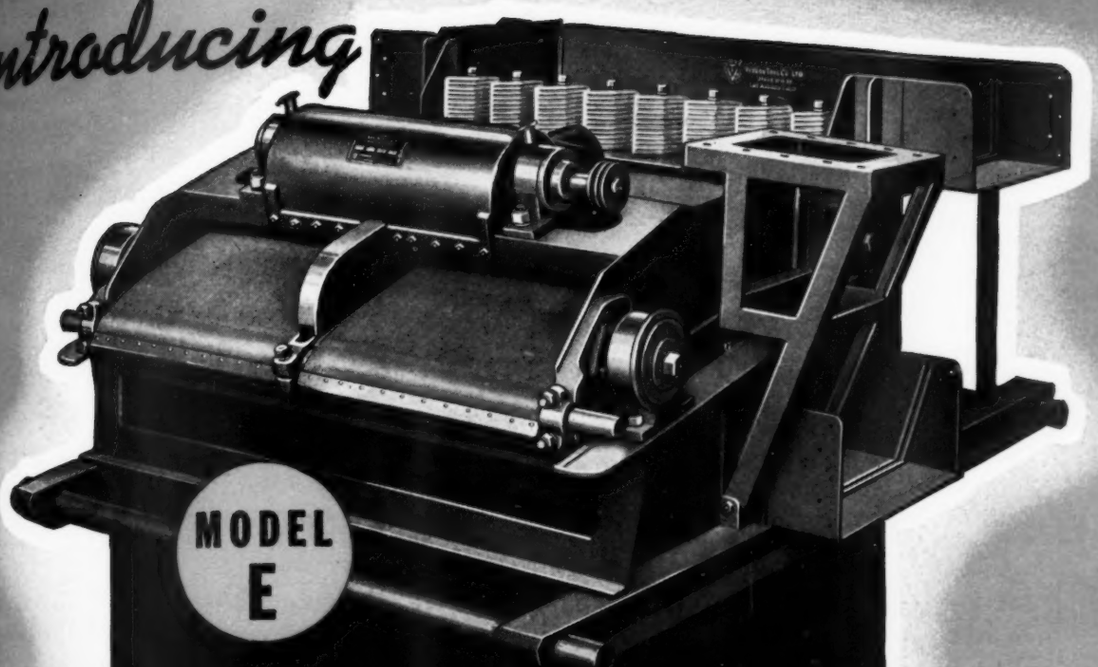
The rerun pipe still is a double furnace, fired at the base, having tubes supported on the bridge wall. The burners are at the base of this heater so that the flames and heat from combustion travel upward toward the breeching of the stack. The flow of the liquids through this heater is in parallel, each side of the furnace being equipped with a separate bank of heating tubes. Distillate pumped to the heater is split at the discharge of the centrifugal charge pumps by a ratio-flow stabilog, so that each bank of tubes will receive the volume of feed required. If conditions demand that one bank of tubes receive a greater volume of pressure distillate to obtain the required re-running results, this instrument may be adjusted accordingly

The temperature of the pressure distillate upon leaving the final water-wash at the soda neutralizing unit is approximately 55 deg. fahr., and after passing through the column-vapor and tower-bottoms exchangers, it has a temperature of about 150 deg. fahrenheit. After leaving the transfer line at the pipe still heater, the temperature is only about 385 deg. fahrenheit. Entering the fractionating column under

is maintained at a temperature of 250 deg. fahr. in the usual manner—by pumping condensate back to the top for liquid trip. The overhead stream is condensed and cooled in suspended shell and tube condensers with water from the large cooling tower. Exhaust steam from the steam turbines and reciprocating pumps in the transfer and pipe line pumprooms is used for processing the distillate while yet in the column. The exhaust steam is passed through a bank of superheater coils to bring the temperature of it up from

Maximum treating temperature	30°F.
Minimum treating temperature	20°F.
Acid-treating yield	94.5 %
Acid-treating loss	5.5 %
Re-run yield	97.4 %
Re-run loss	2.6 %
Overall yield, finished gasoline	92.4 %
Octane, raw stabilized distillate	72.5
Octane, acid-treated, rerun gasoline	71.5

Introducing



a new and improved

McNEELY
Vibrating MUD SCREEN

Typically VERNON in quality and embodying advantages resulting from many years of mud screen manufacturing experience, the new and improved McNEELY Vibrating Mud Screen more than meets the needs of the oil industry for a dependable supply of clean, plastic drilling fluid at lowest cost.

Advantages such as super-strength to withstand hardest usage; ***completely unitized*** design for convenient handling in the field; large capacity to handle the biggest mud pumps; a curved screen surface (exclusive) to increase capacity and prolong screen cloth life; and simple, quick installation or removal, all contribute to the remarkable efficiency and economy of this new unit.

Be sure to see and learn about the new and improved McNEELY Vibrating Mud Screen. It's in step with the times—it's a vital factor in assuring faster, more economical drilling.

Ask for ***your*** copy of Bulletin No. 101 which illustrates and describes the new McNEELY Vibrating Mud Screen.

LARGE CAPACITY
The capacity is approximately 650 gallons of drilling fluid per minute. This is equal to the output of the largest mud pumps.

UNIFORM VIBRATION
Advanced design imparts a high frequency elliptical motion to the frame and screen cloth which insures a uniform intensity of vibration over the entire screening surface.

CURVED SCREEN SURFACE
This exclusive feature increases capacity; hastens the disposal of waste cuttings and prevents their clogging the cloth; permits an absolutely tight screen cloth and eliminates flexing or whipping of the cloth. Screen cloth life is greatly increased.

DIVIDED SCREEN CLOTH
Vibrating frame and screen cloth are divided into two sections. Only one-half the cloth need be replaced at one time. Each half is independently tensioned and new cloth is easily installed and stretched taut. Cloth is heavy Monel-Metal wire of special weave—providing higher screening efficiency and much longer life.

COMPLETELY UNITIZED
The sturdy, all-steel welded mud box with integral feed and discharge ditches is mounted on heavy skids and provides a completely unitized screen installation which is conveniently handled in the field.

VERNON TOOL CO., LTD.
2740 EAST 37TH STREET, LOS ANGELES, CALIF.

GULF COAST AND MID-CONTINENT REPRESENTATIVE
McNEELY MATERIALS COMPANY
2935 JENSEN DRIVE, HOUSTON, TEXAS
EXPORT
THE NATIONAL SUPPLY CORP. • OIL WELL SUPPLY CO.

View of the Mason oil field. At the extreme right is Mason Oil Company's No. 3 Kyle. The discovery well, their No. 2 Kyle, is at the extreme left, while the south offset, Stanolind No. 1 Kyle, is in the left background

Development of the Mason Field

Heaving sand, loss of circulation in cavernous lime, and low-formation pressure cause difficulties in drilling and well completion in new West Texas field

By JOS. A. KORNFELD

DIFFICULTIES encountered in drilling through cavernous lime sections, loss of circulation, handicaps caused by heaving sand, and unusual completion problems occasioned by low formation pressures, all have had to be overcome in developing the new Mason oil field in northwestern Loving County, West Texas. Sweet crude oil of high gravity and favorably high allowables have attracted considerable attention to the area, marking the revival of development in the Delaware basin after a dormant period of more than seven years. Diesel rotary drilling is a feature of the development.

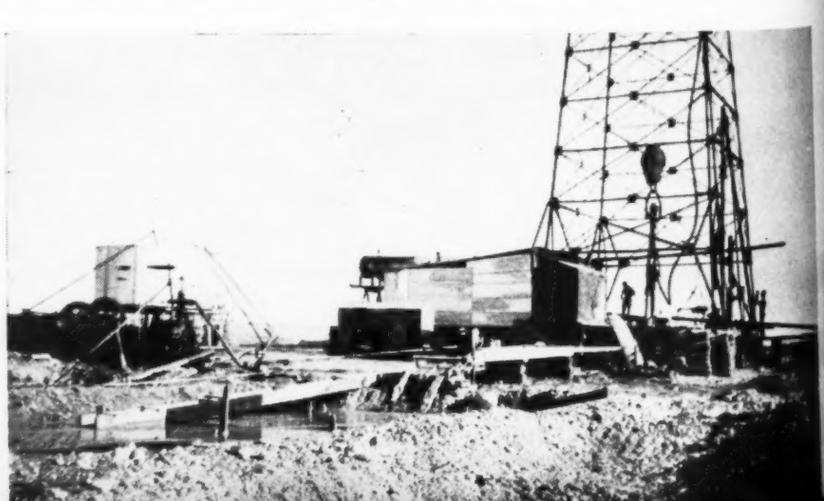
The Mason pool is three and one-half miles south of the New Mexico state line in northwestern Loving County. The nearest oil production is in the Wheat oil field in the same county, 16 miles to the southeast. A branch line of the Santa Fe Railroad extending northward from Pecos City in Reeves County, through Carlsbad, Eddy County, New Mexico, serves the area and is paralleled by a modern gravel-surfaced highway. Equipment and supplies are brought in from Kermit in Winkler County on the east, and from Pecos City through Mentone on the south.

Although the area is semi-desert in physiography, yet the locality is favored with improved roads following section lines over caliche scarps and rolling terrain. The topographic relief averages only 45 ft., with period fault scarps of massive sandstone; conglomeratic lime, occurring at intervals of one-eighth mile, heightens the relief. In places, the area is covered by sand dunes having a thin mantle. The area is almost isolated, distances from 30 to 50 miles between ranch houses being common. Vegetation is sparse and consists chiefly of cacti, Spanish dagger, and occasional mesquite bushes.

The Mason oil field was discovered January 20, 1937, by the Mason Oil Company of Texas, a subsidiary of Michigan Gas and Oil Company (Delaware) of New York City. The company holds 4000 acres around the discovery well.

The first test well in the field was drilled with cable tools to a total depth of 4015 ft. on November 1, 1935. It was in section 22, Block 55, T. & P. R. R. survey. Though the well appeared to be a failure when completed, subsequently the hole filled up 1500 ft. with sweet oil when testing an additional 1500 ft. of salt water in a sandy stratum in the upper portion of the Delaware Mountain sand. No further drilling was done until June 6, 1936, when the second prospect well was begun two miles west of the initial venture. The reason for drilling the second test at this location was the abnormally high geologic position of No. 1 Kyle, correlated after preparation of a cross-section of wells drilled in adjacent townships across the strike.

No. 2 Kyle was located 2310 ft. from the north and east lines of section 20, block 55. Drilling began with cable tools. The hole was carried to a depth of 1150 ft., but because of heaving sands and caving hole the operators moved out the standard tools and installed rotary equipment for deeper drilling. Drilling then progressed to a depth of 1780 ft. where cable tools were reinstalled to complete



Rig arrangement at Stanolind Oil Company's No. 1 Kyle. At the extreme left is the Diesel-driven slush pump; in the left background is the water-circulating tank for handling cooling water for the Diesel engines. The shed in front of the rig houses the air compressor, electric generator, and gasoline engine, all mounted as a unit. In the extreme central background is the Diesel fuel supply tank mounted 20 ft. aboveground

With the CONTINENTAL-SHELDON "CHB" Compounding TRANSMISSION

Everything is Under Control

In announcing the new Continental-Sheldon CHB Transmission, recognition is given to the special need in many territories for a light, economical, yet wholly dependable Dual Internal Combustion Engine Drive.

Continental Fairbanks-Morse Model 47BO engines are particularly designed for service where initial cost, compactness, and portability are of first importance. Compound operation offers the advantages of combined synchronized power of both engines for either hoisting, rotating, or pump service, and prevents the necessity or shut-downs in drilling rig operations, by permitting the use of either engine in the event of engine trouble.

An added feature is the built-in auxiliary unit which may be driven from the engines while operating, or from a standby power unit while rigging up. Steady, unflickering lights are provided by a special generator giving constant voltage throughout the engine's entire speed range.

THE CONTINENTAL SUPPLY COMPANY

General Offices: DALLAS, TEXAS

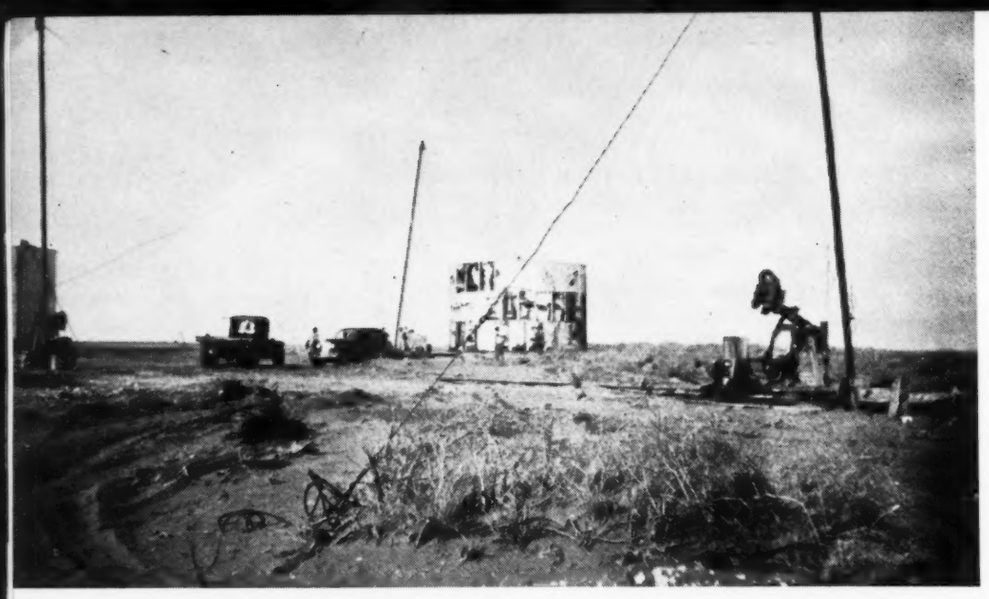
Export Office: CONTINENTAL EMSCO CO., Inc.
30 Rockefeller Plaza New York City, N. Y.

Representatives:

LONDON MARACAIBO PLOESTI BUENOS AIRES

"SERVING THE OIL AND GAS INDUSTRIES"

CONTINENTAL



Water wells in the Mason field. The pumping jack can be seen at the extreme right. The mast is made of 6-in. drill pipe mounted on a wooden base

the well. Past experience at the Wheat pool dictated the use of cable tools for completion in the Delaware sand, characterized as it is by low formation pressures, wells rarely filling up more than 1200 ft, with water after standing for 24 hours. The top of the Delaware formation was found at a depth of 3860 ft., or at a subsea level of 807 feet. On February 15, 45 ft. of the formation had been penetrated when the first oil and gas showing was had, ten ft. in a gray sand. After penetrating 16 ft. into this gray sand, the well in 12 hours filled up 2000 ft. with sweet crude of high gravity, accompanied by an estimated flow of 500,000 cu. ft. of gas daily. In 20 hours the well filled up 3,000 ft. without a trace of salt water. The showing, estimated at 50 bbl., was shot on January 20 with 120 quarts of nitro-glycerine, using a 5-ft. anchor and a load of 60 ft. of water and 3200 ft. of oil. The well was cleaned for a period of one-half hour before the oil was turned into tanks for gauging. On its initial flow the well produced:

1st hour.....37 bbl.
2nd hour.....20 bbl.
Av. first seven hrs.....17 bbl. an hour.

The flow was accompanied by an estimated 1,000,000 cu. ft. of gas. The oil was of 41.4 deg. gravity A.P.I. and an analysis showed a sulphur content of only .08 percent. Of 10,000 cc. of the oil charged to vacuum stills the refinery analysis showed a gravity of 60.1 deg. A.P.I. and 52.5 octane number at 350 end point distillation. On February 17, 1937, a Railroad Commission potential test was made that showed 285 bbl. on 24-hour gauge. A later gauge made that month showed an output of 299.5 bbl. in 24 hours.

Development of the area was resumed the following month when drilling was started by Mason Oil Company at their No. 3 Kyle, the west offset. This test is being drilled with steam-powered rotary equipment, consisting of a 10-in. by 12-in. drilling engine, a three-speed drawworks, and two slush pumps for the drilling fluid. Steam is supplied from three 90-hp. boilers at from 175- to 200-lb. pressure. Feed water for the boiler is supplied through 600 ft. of 4-in. water line from a 1500-bbl. water storage tank on the lease. During drilling an occasional two-day shutdown resulted from a lack of sufficient water.

The well was drilled to 900 ft. with 6-in. drill pipe; from this point on 4½-in. drill pipe was used. An acid bottle was run at intervals of 500 ft. for checking the verticality of the hole.

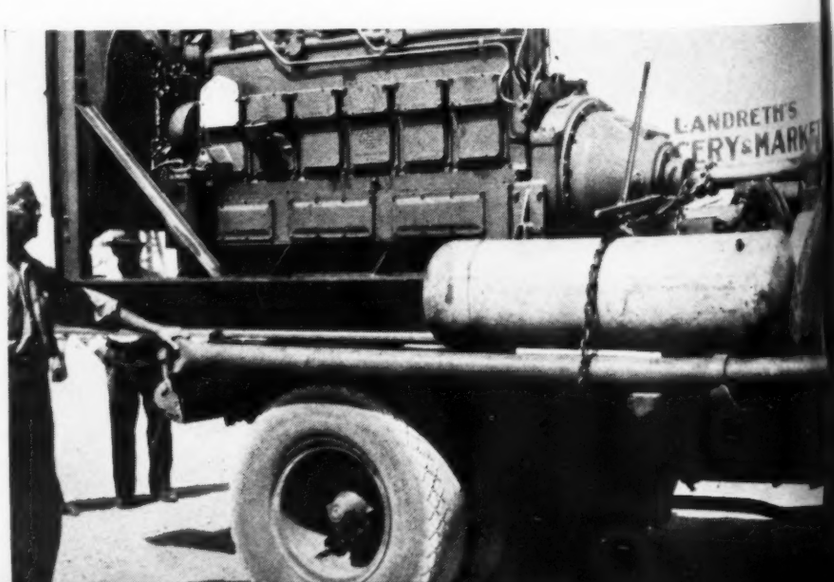
Drilling had progressed to 3869 ft. in the Delaware Mountain formation by April 21 and a 7-in. oil string set at that depth. Cable tools were rigged up to drill-in. On May 3, the well filled up 300 ft. with oil in a period of only 30 minutes. A nitro-glycerine shot was used to open up the formation in the vicinity of the hole.

The second operator to enter the area was Stanolind Oil and Gas Company, purchasing an 80-acre tract south of the discovery well, and moving in at the south offset to Mason Oil Company's No. 2 Kyle, the discovery well. Stanolind contracted for the drilling of their initial test with the Olson Drilling Company. This contractor uses a Diesel-powered rotary. It consists of a 150-hp. drilling engine, with a rated operating speed of 400 revolutions per minute. The engine is direct-connected to a 3-speed drawworks driving a 27-in. rotary table. The drilling engine is cold-starting, being "kicked-off" by an air-compressor unit supplying air at 250-lb. pressure. The air-pressure tank is mounted on 6-in. pipe skids together with the compressor and lighting generator. The compressor is driven by a gasoline engine through a countershaft. Belt-driven from the countershaft, a 3-kw. electric generator supplies rig and boiler lights. The slush pump is driven through a gear by a 150-hp. Diesel engine. Water for cooling the Diesel engines is circulated from a 250-bbl. tank, installed between the drilling engine and the slush-pump engine. Diesel fuel is fed from a 1640-gal. tank mounted 20 ft. above ground, flowing to the engines by gravity.

The drilling time with Diesel-powered rotary equipment is illustrated by Stanolind's No. 1 Kyle. On this test, 150 ft. of hole was made in 24 hr. on April 21, when a drilling depth of 3272 ft. was reached.

A vibrating mud-screen is operated by a 2-cylinder gasoline engine.

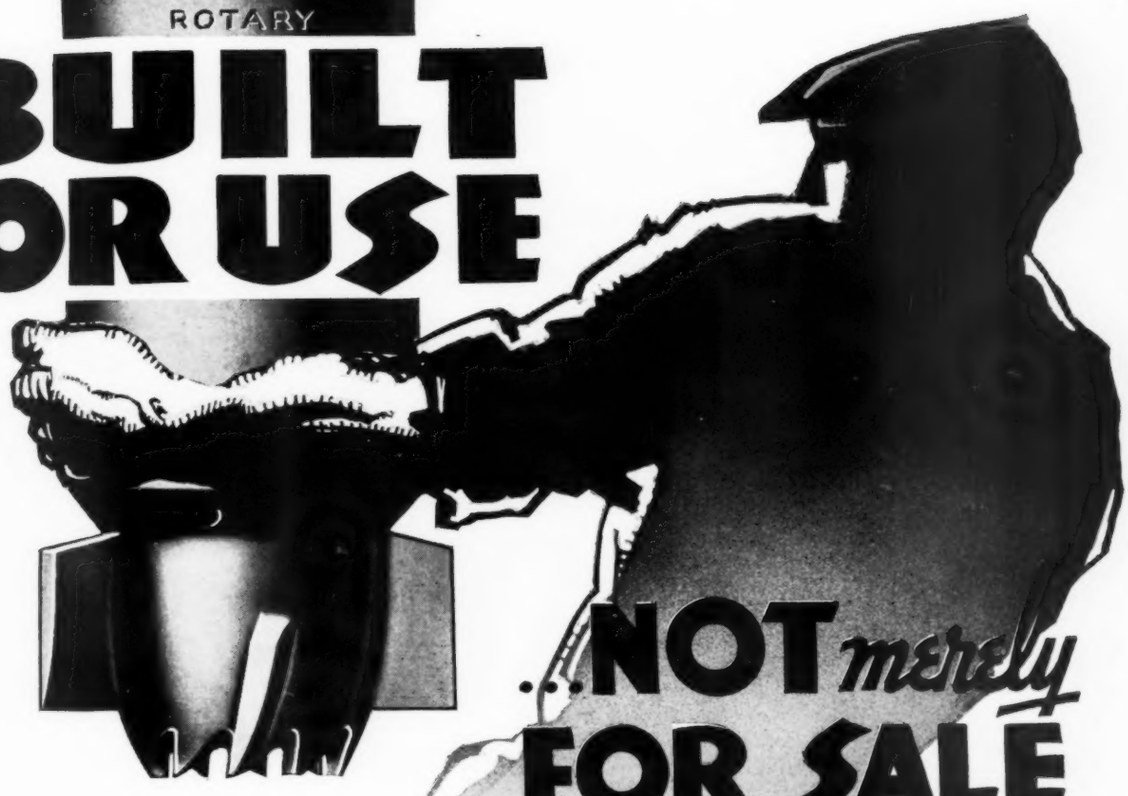
Production from the discovery well has been handled by three 1000-bbl. flow tanks. Lease storage consists of two 5000-bbl. steel tanks. Gas accompanying the oil is handled by a low-pressure separator.



Portability of Diesel drilling engines employed in the Mason field is illustrated here. This truck is handling a Cummins Diesel enroute to Finley & Cherry's No. 1 Kyle on the west side of the field

MODEL-A
ROTARY

BUILT FOR USE



...NOT *merely* FOR SALE

Experience in manufacturing a product for sale can produce many desirable features; such as modern lines, symmetrical design, and fine appearance. Intensive development and manufacture of a product for use on a highly competitive basis, however, must of necessity assure efficient, economical operation and upkeep; superior performance; and outstanding results in service.

For more than fifteen years Elliott Core Drills have been manufactured for use by this company in conducting a coring service to oil companies. Elliott is much closer to actual coring practice, therefore, than if these products were merely manufactured for sale. The first hand experience thus gained has enabled development and improvement of its equipment in line with field conditions and requirements; and to insure efficient, economical and satisfactory performance on the job.

Elliott pioneered and developed oil well coring practice to its present stage with Elliott Core Drills - - - for more than fifteen years the leading coring equipment - - - available to and used by oil companies in all parts of the world.

Core

ELLIOTT CORE DRILLING COMPANY
4731 East 52nd Drive, Los Angeles, California, U.S.A.
Export Office: 420 Lexington Avenue, New York City

Heaving sands, encountered in 15-ft. thicknesses from the surface to depths as great as 1920 ft., have presented a serious drilling problem. At Stanolind Oil and Gas Company's No. 1 Kyle this was overcome at one level by using a mixture of 20 tons of sand and one ton of Aquagel to which was added one ton of cotton-seed hulls.

A cavernous formation encountered in the Permian anhydrite at approximately 1100 ft. caused loss of circulation. The problem was solved by use of the following mixture:

Mud	6 tons
Aquagel	4 tons
Cotton-seed hulls	2½ tons

Of importance from an engineering and development standpoint is the unusual geologic structure of the pool. Oil accumulation is the result of a local terrace plunging eastward into the dip against a normal east dip of 90 ft. to the mile. This is typical of local structure traced in the Wheat pool of Loving County and at the Shipley Oil Company discovery oil well north of Barstow in northwestern Ward County. The consensus among geologists who have studied the area is that, originally, the structure was a closure, but with eastward tilting of the Delaware basin sediments in Miocene time, the closure was raised to form a terrace. Production is encountered in a coarse to medium-coarse sand series in the uppermost member of the Delaware Mountain formation of Lower Permian age. It is found beneath a cap rock of 35 ft. of black, dense lime and thin, fissile black Frijole shale. Absence of hydrostatic head is shown by the speed with which the hole of the discovery well filled with oil—2000 ft. in 12 hr. and 3000 ft. in 20 hours.

Principal markers are as follows:

1st Anhydrite (massive)	1395 ft.
Base salt	3667 ft.
Top Delaware lime	3860 ft.
First gray sand (Delaware)	3895 ft.

Derrick-floor elevations vary from 3051 to 3063 ft. on three adjacent wells. Highway graders are used to prepare lease roads for moving in equipment and handling maintenance machines.

The first outlet for the field has been completed in the form of a gathering line extending from the discovery lease in section 20, block 55, township 1, Texas and Pacific Railway survey, ten miles due south then west to the intersection of the Pasotex Pipe Line Company line with the Santa Fe railroad in the southwest quarter of section 36, block 56, township 2, Texas and Pacific Railway survey, one-fourth mile west of the Pecos River. The Pasotex pipe line extends from the Wheat oil-field of Loving County westward to El Paso, El Paso County, Texas, where the Standard Oil Company of Texas maintains a 14,000-bbl. crude oil refinery. The Santa Fe Railroad has constructed a spur (siding) at the intersection of the Pasotex pipe line and the Mason feeder line.

The water-well engineering in the field is of interest. Although the number of water wells drilled at the time Mason Oil Company's No. 3 Kyle was

BASIC DATA ON MASON OIL FIELD LOVING COUNTY, TEXAS

Data	Mason 1 Kyle	Oil 2 Kyle	Company 3 Kyle	Stanolind 1 Kyle	Finley & Cherry 1 Johnson	Woodley 1 Kyle
EQUIPMENT AND DRILLING DATA:						
CASING						
Conductor	12" at 385'	15½" at 448'	10¾" at 900'		12½" at 180'	
Protection	10" at 389'	12½" at 934'				
	8¼" at 1226'	10" at 1157'				
	6⅝" at 1712'	8¼" at 1775'				
Oil String	5½" at 2840'	5½" at 2910'	7" at 3689'	7" at 3732'		
Status	Dry*	Oil Well	Drlg.	Drlg.	Rig Up	Moving In
Drlg. Time						
PRODUCTION DATA:						
Init. Prod.						
Before Shot	50 bbl.					
After Shot	285 bbl.					
Gravity Oil	41.4 deg.					
Gas. Volume Est	1 m.c.f.					
Shot Practice						
Size	120 qts.					
Position of Shot	3895 ft. to 3911 ft.					
GEOLOGICAL DATA:						
Elevation	3001 ft.	3053 ft.	3056.66 ft.			
Top Sand	3949 ft.	3895 ft.				
Top Sand (Subsea)	—948 ft.	—842 ft.				
Total Depth	4015 ft.	3911 ft.				
T.D. (Subsea)	—1014 ft.	—862 ft.				
First saturation	3970 ft.	3905 ft.				

*1500 ft. oil in hole.

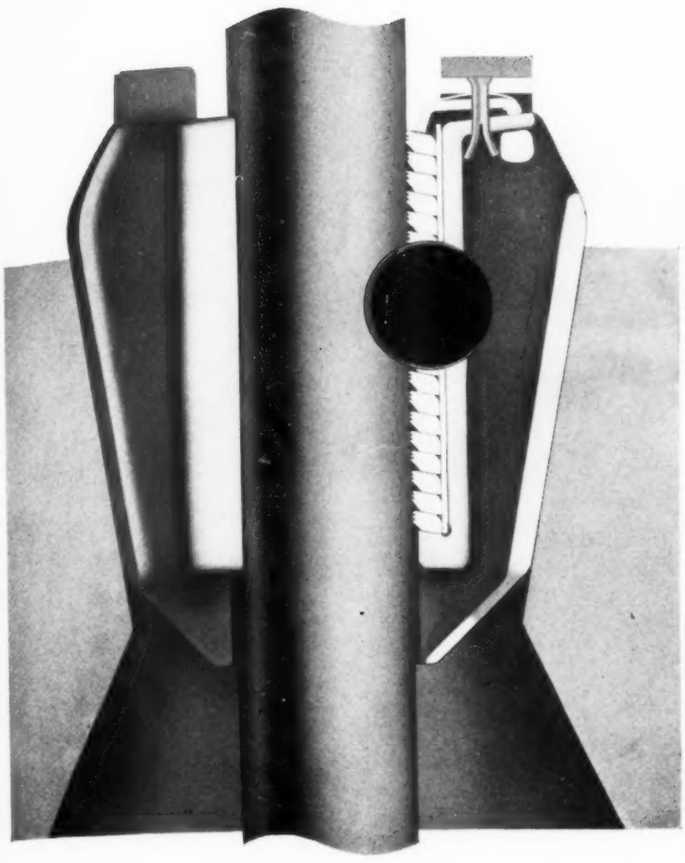
CRUDE OIL ANALYSIS

Sample marked: No. 2 Kyle, Loving County, Pecos, Texas.
Submitted by: James B. Berry Sons Co., Inc.

TESTS ON CRUDE		DISTILLATION ON CRUDE:	
		Initial Boiling Point	120 Fahr.
A.P.I. Gravity	41.4	5% over at	184 Fahr.
Flash	Room Temperature	10% " at	214 Fahr.
Viscosity at 100 F	37 Seconds	20% " at	276 Fahr.
Pour	—0 Fahr.	30% " at	338 Fahr.
B. S. & W	Trace	40% " at	421 Fahr.
Acid Tar	10.0%	50% " at	510 Fahr.
Conradson Carbon	0.83%	60% " at	604 Fahr.
Sulphur	0.08%	70% " at	664 Fahr.

10,000 cc's charged to vacuum still, gasoline content distilled at atmospheric pressure. Vacuum used after taking off gasoline.

	350 EP Gasoline	400 EP Gasoline	Kerosene from 350 EP	Kerosene from 400 EP	Gas Oil	Wax Distillate	Fuel (and Loss)
Yield	33.9%	38.4%	18.1%	15.6%	11.0%	20.0%	15.0%
Gravity	60.1	58.5	42.7	40.9	35.4	28.6	29.6
Color (Saybolt)	30	30	30	30	1 NPA		
Doctor	Negative	Negative	Negative	Sl. Pos.			
Octane No.	52.5	49.5					
Flash			153° Fahr. (T.C.C.)	173° Fahr. (T.C.C.)	230° Fahr. (P.M.)	395° Fahr. (C.O.C.)	540° Fahr. (C.O.C.)
Flash							
Viscosity (Saybolt at 100 Fahr.)						178 Sec.	
Viscosity (Furol at 122 Fahr.)							784 Fahr.
DISTILLATION:							
Initial B.P	109 Fahr.	114 Fahr.	376 Fahr.	401 Fahr.	474 Fahr.		
5% over at	150 Fahr.	156 Fahr.	387 Fahr.	412 Fahr.	506 Fahr.		
10% " at	168 Fahr.	174 Fahr.	392 Fahr.	421 Fahr.	520 Fahr.		
20% " at	192 Fahr.	198 Fahr.	404 Fahr.	430 Fahr.	538 Fahr.		
30% " at	210 Fahr.	218 Fahr.	412 Fahr.	438 Fahr.	550 Fahr.		
40% " at	226 Fahr.	237 Fahr.	424 Fahr.	448 Fahr.	562 Fahr.		
50% " at	240 Fahr.	256 Fahr.	438 Fahr.	457 Fahr.	574 Fahr.		
60% " at	257 Fahr.	278 Fahr.	450 Fahr.	468 Fahr.	586 Fahr.		
70% " at	272 Fahr.	300 Fahr.	464 Fahr.	476 Fahr.	598 Fahr.		
80% " at	292 Fahr.	328 Fahr.	480 Fahr.	486 Fahr.	610 Fahr.		
90% " at	318 Fahr.	352 Fahr.	502 Fahr.	501 Fahr.	624 Fahr.		
End Point	353 Fahr.	402 Fahr.	524 Fahr.	526 Fahr.	658 Fahr.		
Recovery	97.0%	98.0%	98.0%	98.0%	98.0%		
Pour Test						20 Fahr.	85 Fahr.



SLIPS sticking in BOWL MAKE FOR COSTLY PULLING DELAYS

WITH MISSION SLIPS
THE ROLLING MOVEMENT
OF THE DOGS FROM THE
PIPE BRINGS ABOUT

● IMMEDIATE RELEASE ●

Resulting in:

NO COSTLY PULLING DELAYS

MISSION MANUFACTURING CO.

HUMBLE ROAD - HOUSTON, TEXAS

Mission Slips . . . Mission Valves . . . Mission Pistons . . . Mission Piston Rods . . . Mission Swabs

Sold Through Supply Stores Everywhere

started was insufficient yet the equipment used in operating deserves special mention. A Model N water-well drilling rig is used in drilling a well to a depth of 300 feet. The well is then cased with 20 joints of 2½-in tubing. Pumping equipment comprises a working-barrel, sucker rods and a ⅞-in. diameter polished rod. Each of three water wells is operated by jacks at a speed of 20 strokes per minute. Maximum recommended polished rod load is 2200 pounds. The jacks are driven through a gear-increaser equipped with tapered roller bearings, powered by gasoline engines. A fourth water well is produced by jetting with air. The jack and gasoline engine are mounted as a unit on pipe skids of welded construction, an advantage of portability in event of water exhaustion from a given sand lens. The second water well drilled is equipped with pumping equipment mounted on steel skids and set on concrete foundations. The time required for drilling a well is two days from the time the drilling engine is set up until the sand is reached. The wells pump directly into a 1500-bbl. water tank equipped with an outside water-level indicating device on a 17-ft. vertical indicator. Each well is equipped with a mast constructed of 6-in. drill pipe and supported by four guy wires. Water well No. 2 supplies ten gal. of water a minute through 3-in. tubing, and water well No. 4 pumps 25 gal. a minute through 4-in. tubing.

The Most Economical Line Shaft

By W. F. SCHAPHORST

IT is not commonly known that there is a *best* way in which to drive a line shaft. By doing it properly the cost of power and the cost of shafting, in many instances, can be reduced considerably. It is accomplished by placing the driving motor or main driving pulley of a line shaft in the correct place. The accompanying sketches show how this is done.

The pulleys on line shaft marked I are ten ft. apart. Pulley A will transmit ten hp.; B, 15 hp.; C, 30 hp.; D. five hp.; E, ten hp.; F, 20 hp.; and G. 25 hp., respectively, with a shaft speed of 200 revolutions per minute. The problem is to place the motor in the position that will require least weight of shafting and cause least power loss due to friction.

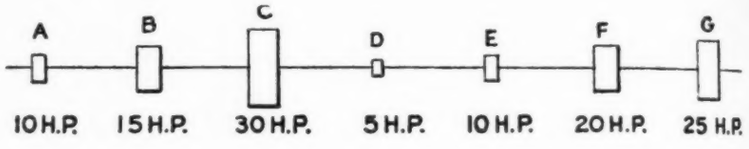
Sketch II shows the sizes of line shafts required between the pulleys to transmit the hp. shown with the motor or driving pulley at the extreme left end. The minimum size of shaft is 2¼ in. at the right end and the maximum size is 3⅜ in. at the left end.

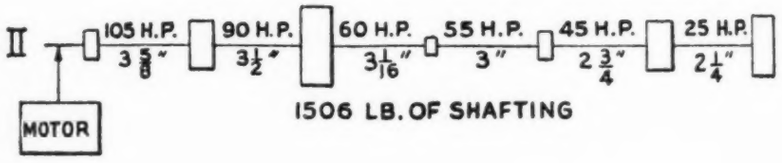
Sketch III shows the sizes of shafting required with the drive at the extreme right end. This time the minimum size of shaft is 1¾ in. and the maximum size 3½ inches.

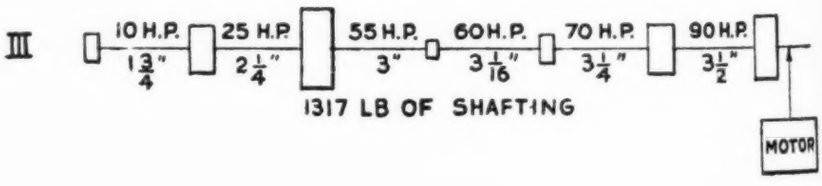
Sketch IV shows how to determine the correct position: Work inward from both ends and place the motor on the "maximum" size of shaft. The maximum size here is 3 inches.

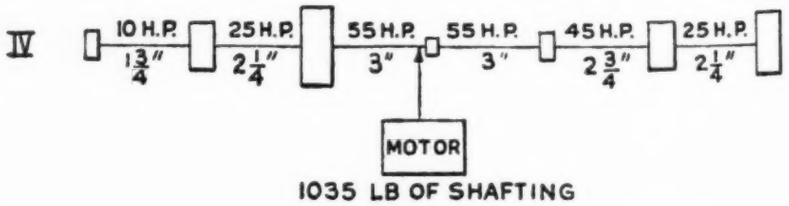
Computing the weights of II, III, and IV, it will be found that with ten ft. between each pulley, 1506 lb. of line shafting will be required for line II, 1317 lb. for line III, and 1035 lb. for line IV. In other words, line II requires 45 percent more than line IV, and line III requires 27 percent more than line IV.

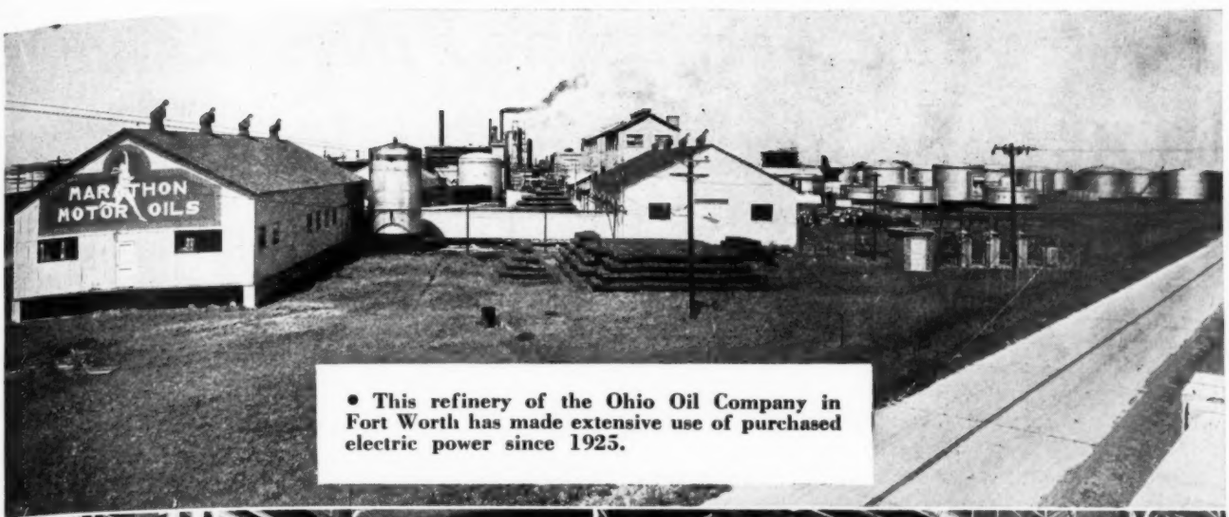
Line IV will absorb least friction because the smaller the shaft the less the surface speed, and consequently the less the power loss.



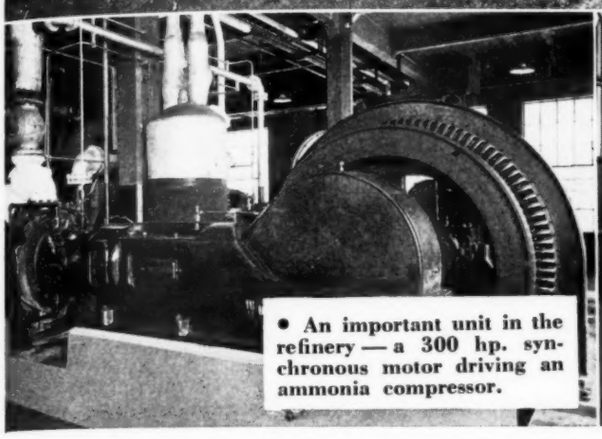




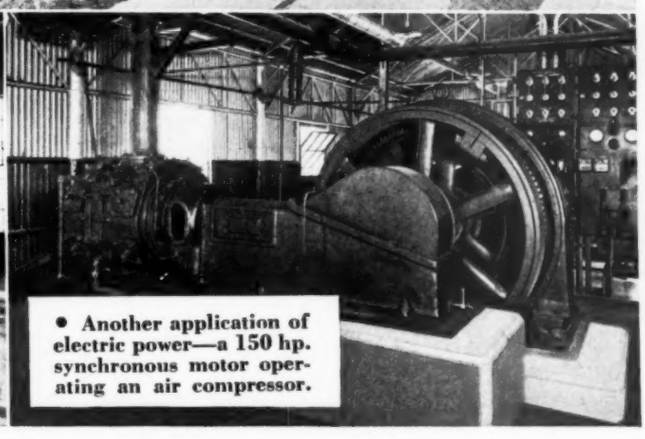




• This refinery of the Ohio Oil Company in Fort Worth has made extensive use of purchased electric power since 1925.



• An important unit in the refinery — a 300 hp. synchronous motor driving an ammonia compressor.



• Another application of electric power—a 150 hp. synchronous motor operating an air compressor.

Purchased Electric Power Has PROVED Its Economy in this Refinery

● Since 1925, purchased electric power has permitted the continuous expansion of the Ohio Oil Company's Fort Worth refinery without excessive capital expense. More and more uses have been found for this tireless worker until at the present time the refinery has more than 1,900 horsepower connected. Power is fed through selective switches over two separate lines, assuring continuous service.

● Texas Electric Service Company power engineers, skilled in the application of electric power to refinery operations, are always available for power problem discussions with refinery operators in our territory.

TEXAS ELECTRIC SERVICE COMPANY

Factors Affecting the Price of Crude Oil Under a Balanced Economy[1]

By J. ELMER THOMAS[2]

UNDER a free economy price is controlled principally by the interplay of supply and demand. In the oil industry today we do not have a free economy but instead supply and demand to a certain extent are regulated by governmental agencies for the public welfare and consequently the classic influences affecting price are somewhat altered. The writer, as one who was in part responsible for the first public proposal of a balanced economy, has been interested in scrutinizing the factors that do influence crude oil prices and in analyzing the economics of price under a controlled output.

The report of the committee on petroleum economics of the Federal Oil Conservation Board in March, 1930, of which the writer was chairman, is referred to, although the full credit for the concept of balancing supply with demand belongs properly to Dr. Joseph E. Pogue and the writer acknowledges the indebtedness of the whole committee to him, its secretary.

The expression, "balanced economy," is not meant to infer that supply and demand are in exact balance, as this would be mechanically impossible. By "balanced economy," as used herein, is meant an attempt to regulate the produced supply to the approximate levels of the consumed demand; but even this has not been the exact goal during the last five years. It was clearly recognized that with a thoroughly adequate proven reserve and with a more than adequate potential producing capacity our stored inventories were far too high and thus constituted a physical and economic waste. The balanced program accordingly was designed to withdraw progressively from stocks a part of the required supply and obtain the balance from current production. This degree of regulation nevertheless did remove the normal workings of the law of supply and demand as

J. ELMER THOMAS

the major factor determining crude prices because advancing the price could not call forth additional supply beyond the current proration levels, although a reduction in demand below the allowed output might have caused price declines. The latter did not take place, and could not take place, because a certain amount of surplus storage was being withdrawn each month, more if the allowed output undershot the actual demand, or less if consumption fell below the anticipated levels.

Last fall, when this program had been carried on for about four years, storage inventories were recognized to have reached about the minimum levels for their proper use as working stocks. Now variations in the allowed output, departures of estimated demand from the actual consumption witnessed, will have a different influence in that crude oil storage may increase—as it has during the past two months—as well as decrease. This development gives more point to the discussion of price undertaken herewith.

What should determine a proper crude price quotation under these conditions? First and foremost we must list the cost of production. Over any considerable period the industry as a whole must recover from the sale of crude its cost of finding and producing a barrel of oil and, over a term of years, with a profit, else the capital required to continue this essential industry will not be available. The lure of the game, the pleasure of wildcatting, is insufficient to bring into the business the sums of money required now to discover and produce a billion and a quarter barrels of oil annually.

Because of the nature of the business, costs are exceptionally difficult to ascertain accurately in the producing division. When a new pool is brought in the total barrels of reserve discovered is not known definitely nor can the final cost of producing them be estimated closely. At the outset the development cost must be spread over an estimated number of barrels, to be withdrawn during an indefinite number of years at an unknown rate. Even this brief generalization illustrates the complexity of the problem. Similarly the lifting cost will depend upon a series of indeterminate variables. Other items that make up total production cost—taxes, interest, supplies, wages—likewise are incapable of accurate determination in advance. Nevertheless, a proper price structure for crude oil must deal with such figures even while recognizing them as approximations.

Finding costs are especially difficult to determine, particularly for the future but also for the past, since discoveries seem to occur in irregular periods or cycles and success is not necessarily proportionate to the effort expended. We can scrutinize the past record and, within certain limitations, which, however, represent important perplexities, arrive at an approximate figure for what it did cost to find a barrel of oil, say five to ten years ago. Such an analysis has been attempted on several occasions and merely inspecting the methods used and the results attained will indicate the difficulties involved. Then to project such a study into the future becomes extremely hazardous.

Yet it is tomorrow's cost of production, not yesterday's, that should determine the price of a barrel of crude

[1]Address delivered before the Joint Meeting of the American Institute of Mining and Metallurgical Engineers, Texas Agricultural and Mechanical College, College Station, Texas, April 15, 1937.

[2]*Petroleum Analyst*, Houston, Texas.

There's Money "Here" For Oil "Anywhere"

Whether your operations are in Texas, Kansas, Louisiana—anywhere in the Mid-Continent area—we are interested in taking care of your financial requirements on all sound oil propositions. You'll find it to your interest to discuss your financial needs with "The Oil Bank of America."

This bank is more than a "local" institution. Our services have proven helpful and profitable to oil companies and individual operators alike in all sections of this vast territory.

Many of our officers "grew up" in the oil industry. Our geological engineering and legal departments specialize in oil. Our trained personnel, adequate facilities and ample resources combine to furnish that complete and intelligent service necessary to successful operation in the oil business. Why not discuss your needs with an officer of this bank? Location of your property and distance from Tulsa are no restrictions. *This* bank is close to your operations anywhere in the Mid-Continent area.

NATIONAL BANK of TULSA

The Oil Bank of America

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

The industry probably needs a proven reserve of at least ten year's supply at the present rate of consumption more or less as a normal "inventory." It is our duty to the public, our pledge to civilization, to replace that barrel and therefore it necessarily follows that it should sell for at least the cost of replacement. This seems to the writer almost axiomatic and yet under certain conditions it might lead to controversies.

For instance, if a period characterized by remarkable successes in exploration, with extraordinarily large reserves discovered at comparatively low costs, were to be followed by another period featured by a dearth of successes and consequent high costs for the new supply developed, we might witness the exploitation of crude produced at prices far lower than current and probably future cost of replacement. Yet advancing crude prices to the levels for future replacements indicated thereby might cause serious criticism of the high earnings that would be shown temporarily for the more successful companies even though others less fortunate were not breaking even. If this example applies to the last five years and the five years preceding them, then it is possible that the public his been buying petroleum products too cheaply for the last five years and ultimately this may prove detrimental.

The writer first gave his attention to this point in 1925 when oil was relatively hard to find, immediately after the "bonanza" period of 1923 and 1924 when eight major fields flooded the market with a huge surplus hitherto unknown, which was promptly produced almost without restraint and sold. Prices rose from $1.00 a bbl. to $2.25 in the space of six weeks. This was the old style "feast or famine" with a vengeance. For almost two years no important new fields were discovered, then came a group of them all at once, principally in West Texas and Central Oklahoma, and prices fell from $2.75 back to $1.00.

Then came the birth of proration. As has been pointed out with monotonous regularity in almost every analysis of the subject, all the ills of the oil industry can be attributed, where proration is not practiced, to operators being compelled to drill all their locations as rapidly as possible and bring the oil to surface immediately, thus "reducing it to possession," in accordance with the archaic Law of Capture, as originally expounded by a West Virginia judge in 1862, who thought oil partook of the nature of wild game and called it fugitive and migratory.

Where proration is practiced, most of the difficulty is due to non-acceptance of the general concept of property rights, the ownership of oil in place, thus still compelling operators to protect their holdings, even under prorated outlets, by drilling up all locations, much of which would be eliminated by giving due consideration to the acreage factor in addition to the well potential in assigning lease allowables. Equity thus can be rendered while still preventing the drilling of many wells not needed at this time; and the prevention of unnecessary drilling is perhaps the most important problem facing the oil industry today, else we inevitably shall see every well in the state, from the smallest stripper to the largest gusher, produced at a minimum base allowable.

When a new field is brought in the custom is to hold a hearing to establish well-spacing rules and the practice of the operators concerned has been to introduce testimony on the number of wells desirable to recover the oil efficiently and economically, say with a 10-acre, 20-acre, or 40-acre per well spacing. It is the writer's contention that under present circumstances consideration should be given not to the largest number of wells, and their spacing, that will prove most desirable ultimately, but rather to the smallest number of wells necessary to be drilled at this time.

Were it not for the necessity of continual search for new fields and for the contractural obligations between lessees and lessors, short term leases, early expiration dates, etc., some restrictions upon unnecessary drilling doubtless would have been imposed long ago. The drilling of wells not needed at this time greatly increases the cost of production and is a burden on the producer that must be shared by the consumer. It is to the public interest therefore that drilling activities be curtailed wherever feasible and costs be kept as low as possible.

Because no one can be compelled to sell a barrel of oil for less than it cost to produce it, just as no one can exact a price for a barrel of oil of more than it is worth, the writer has called this cost item the principal factor in determining price. Next in order of influence he would list a factor, really several of them, that might be grouped under the general heading of public interest. As mentioned, it is not to the best interests of the public—the producer, the consumer, or the state—that oil should sell at ten cents a bbl.; nor at ten dollars a barrel. The proper figures lies somewhere in between but just where is a problem upon which no two men might agree. It may be desirable, however, to analyze some of the matters affecting this item.

Consumers might be pleased, even though their permanent best interests were not well served, if crude should sell at ten cents a barrel. Producers might be pleased, though in the long run their best interests might be harmed, if crude should sell at ten dollars a barrel. When a regulatory body, invested with powers of enforcement, fixes the allowed output at any given level, they exert an inevitable influence on the price of crude even though their act is not done with any thought or intent of fixing the price of crude.

This is not to say that prices are supported by production restraint *when such curtailment is not below the rate of consumption*, because they certainly are not. There has been some loose thinking and talking on this point but it should be obvious that if supply fully meets demand, as it does, price will seek its normal level. It is not necessary to have a surplus wastefully produced and expensively stored to attain this goal. Though price in itself has a certain influence on demand, for the past 15 years we have been dealing with a price range for gasoline between 15 and 20 cents a gal., even with steadily mounting gasoline taxes. At the same time the automobile industry has been developing more and more efficient motors with lower and lower gasoline consumption; consequently we have been in a price range where the fuel cost—just a small part of total transportation expense—was only about one cent a mile. It is the writer's opinion that at such levels, or 10 or even 20 percent higher or lower, gasoline follows the economics of salt and not the economics of butter, meaning that just about the same amount will be used regardless of price.

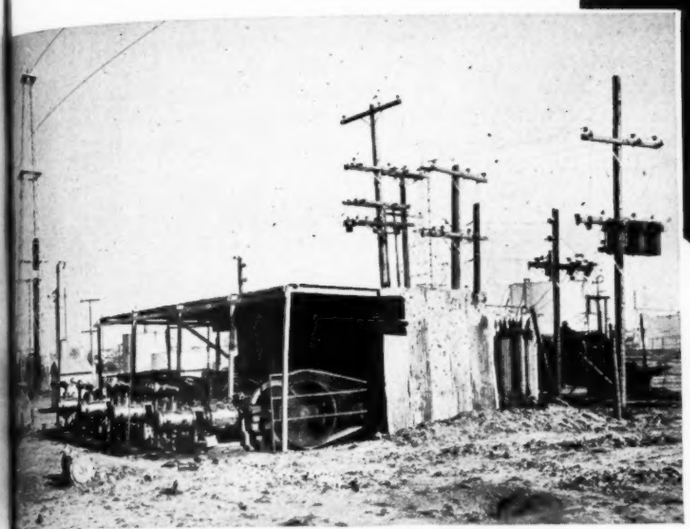
Also under the general heading of public interest there are several other factors that should be considered. A very prominent one is taxes. In addition to the gasoline taxes that constitute a direct sales tax, amounting in some instances to 150 percent of the wholesale price at refineries, there are many other taxes against oil wells, oil lands, pipe lines, refineries, and service stations. These make a very substantial contribution to the cost of running our government and they could not be paid by a profitless industry.

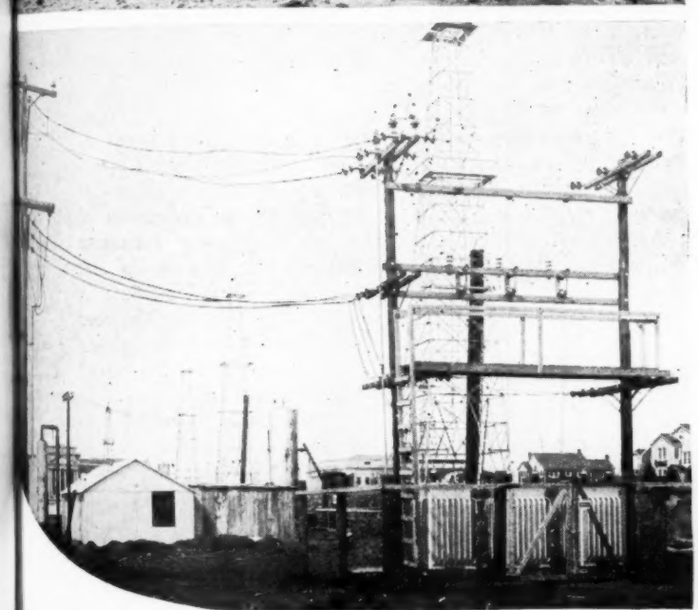
Another item is wages. These pass directly into the channels of trade and benefit the local communities, the states, and the federal government, as do the huge cash payments made annually for lease bonuses and rentals, oil runs and royalties, dividends and earnings. It is to the public interest that these be maintained.

Now let us take up profits as the third factor. The profit motive must

Electrically POWERED

GAS LIFT PLANTS



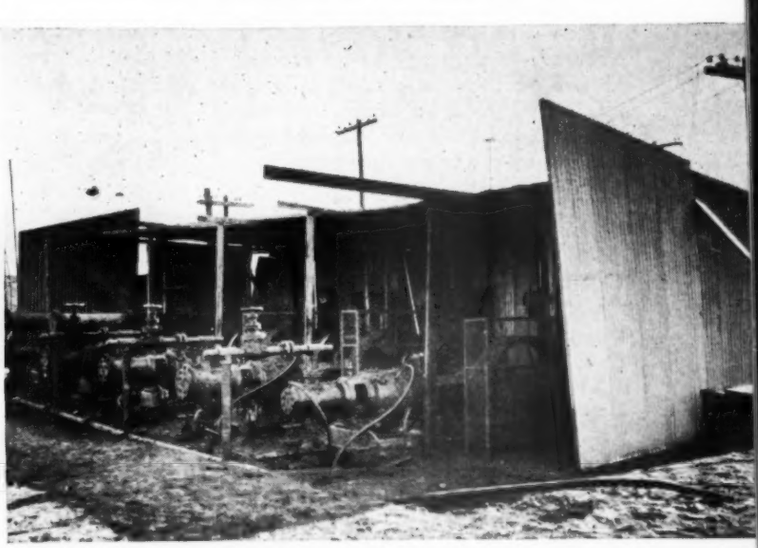


Why not investigate electric power to increase your allowable production? It will help you increase profits!

Are Quickly and Inexpensively Installed.

Assure Maximum Service at Lowest Cost.

Immediate and dependable service is available to you at all times when you use electrically powered equipment. Installations can be made easily and quickly—operation costs are low—and performance is always at its best!



OKLAHOMA GAS AND ELECTRIC COMPANY

Commercial Department

OKLAHOMA CITY — W. H. STUEVE — OKLAHOMA

be the activating force in all business so long as we remain under the capitalistic system, and viewing Europe from this distance and noting what Communist and Fascist dictatorships have brought about there, it would appear that we shall probably choose to stay with our capitalism for some time to come. Profits may then constitute the third general point to be considered in this analysis.

The splendid effort exerted by the industry in the past to keep pace with the ever-growing demand for motor fuel and other petroleum products must be continued into the future; and the equivalent effort promises to be more costly in the future. To the capital frozen in pipe lines, refineries, and service stations must now be added new capital for expanding the production division and, under curtailment as severe as now practiced, such capital will be tied up for a period of years. The old days of flush production, when the cost of a well could be recovered in a few months or weeks of gusher output, are probably gone forever. To attract this new money profits must be available and hence a figure should be reached for crude oil prices somewhat above present and future costs, as previously mentioned.

As a fourth factor might be cited the relationship of oil to other industries and its position in the general economy. Apart from consideration of the influence of general price levels upon wages, taxes, and interest charges already cited, the price of crude oil and petroleum products should bear some reference to standards of living and the purchasing power of a dollar. Unless oil can be sold at its competitive commodity value, the cost of any satisfactory substitute, which seems improbable when it is in over-supply, we must realize that the petroleum industry can get, and is entitled to, only a certain part of the public's dollar. Food, clothing, and shelter also must be paid for but over an extended period the price of oil should follow somewhat closely a fairly uniform position with reference to other commodities and the general price level. The Bureau of Labor's statistical index shows that it has been far below a proper parity for the last five years.

These remarks are not intended to point the way to any formula for determining crude oil prices but rather to set down the several items that should be considered as valid factors affecting crude prices under a balanced economy.

Blow-outs and Wild Crater Wells Controlled by Engineering Methods

EVERY oil operator drilling in high-pressure fields constantly must be on the alert to forestall any conditions that may lead to a blow-out that in turn may develop into a wild well or crater, according to a report recently issued by the United States Bureau of Mines, Department of the Interior. The report points out further that the operator's vigilance must not cease until the well is completed, and oil, gas, or both are flowing to storage or market.

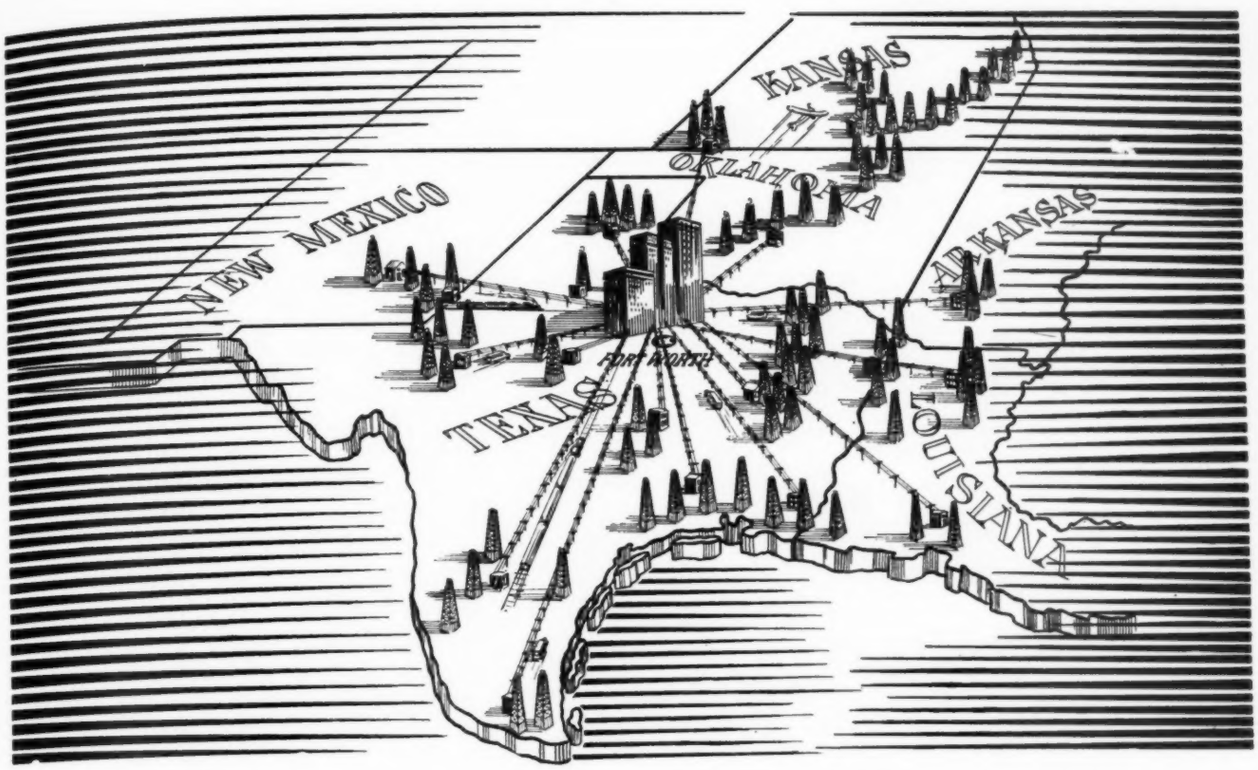
Blow-outs, wild wells, and craters, some of which have caught fire and burned for long periods, are only interesting newspaper items to many persons, but to the individual operator and to the industry generally they represent dreaded specters entailing great property damage and financial loss and frequently loss of life or personal injury to members of the drilling crew and others in the vicinity of the well. These hazards especially are imminent in the Gulf Coast region where deep-lying horizons containing large volumes of petroleum and natural gas under high pressure may get out of control unless proper precautionary measures are taken.

A paper on this subject by Charles B. Carpenter, petroleum engineer of the Bureau of Mines, was read before the American Petroleum Institute, Division of Production, Southwestern District, Dallas, Texas, on April 1, 1937. It is one of a series of reports issued by the Bureau of Mines in which engineering factors pertaining to the control of suppression of formation pressures have been described and has been prepared with the view to disseminating more widely information on the causes of blow-outs and methods of preventing them. The writing is directed to those who are engaged in any capacity in the drilling of high-pressure oil and gas wells, and students of petroleum engineering also may find helpful guidance to further study of the subject.

Following a concise description of the causes of formation pressures, the author describes the functions and properties of drilling fluids, giving generous citations to the literature. A considerable part of the report deals with inadequate weight of the fluid column, and several examples are given in which the quantity of fluid of a given specific gravity is computed to meet actual conditions in wells. Tables contained in the report facilitate the making of such computations that otherwise might be laborious.

Under the general subject of improper consistency of drilling fluids such items as significance of viscosity, "gas cut" drilling fluid, control of gel strength, and significance of stability are discussed. The latter part of the report deals with mechanical and other facilities for preventing blow-outs. Pressure-tested casing, high-pressure fittings, dependable blow-out preventers, quick-closing valves, large-capacity high-pressure "slush" pumps, adequate power, and ample supply of drilling fluid in reserve pits are requisite to adequate protection. Discussion also is directed to the prevention of blow-outs while running formation testers, controlled or pressure drilling, and the prevention of blow-outs in completed oil and gas wells. The need for trained personnel and the holding of frequent and complete "blow-out" drills under simulated impending hazardous conditions is stressed. The conclusion is reached that every well drilled to a high-pressure formation is a blow-out hazard until the Christmas tree is connected and that the same precautions as are used in drilling operations should be observed while running casing or tubing and setting liners and screens.

Copies of I. C. 6938, "Some Causes of Blow-Outs During Drilling and Means of Prevention, with Special Reference to the Gulf Coast Region," by C. B. Carpenter, may be obtained without cost upon request to the Information Division, United States Bureau of Mines, Washington, D. C.



OIL ROADS LEAD TO FORT WORTH

. . . . . and Fort Worth Banks are active in Oil Finance

★ ★ ★ ★ ★

● Fort Worth's strategic location in the economic, geographic and transportation center of the Mid-Continent area long since made this city a capital for the oil industry. Fort Worth's Banks—with their years of experience right in the heart of Mid-Continent developments—offer oil men ample resources and convenient, time-saving facilities . . . as well as a helpful understanding of the oil industry. Give us an opportunity to serve you . . . a thorough discussion of your individual problems may lead to some way in which we can materially help you.

★ **The First National Bank**
★ **The Fort Worth National Bank**
★ **Continental National Bank**

Analyses of Ten Section and Greeley, California, Crude Oils

PETROLEUM from the Ten Section field and the Greeley field in Kern County, California, is wax-bearing intermediate-base oil, according to analyses by the Bureau of Mines, Department of the Interior. The oil is similar to oils of the same classification produced in the Mid-Continent fields, such as the Seminole field of Oklahoma and some oil fields of Kansas. The gravity of the Ten Section and Greeley samples is approximately 37 deg. A.P.I. The sulphur content of 0.28 and 0.37 percent is lower than that of most of the crude oil produced in California. The samples contain approximately 35 percent of total gasoline and naphtha by the Bureau of Mines method of analysis and interpretation. The fractions heavier than gasoline and naphtha, as shown by the approximate summary of the analyses, apparently are similar to corresponding fractions of oil from the Seminole pool of Oklahoma and other oils from Mid-Continent fields.

The discovery well of the Ten Section field was brought in during June, 1936, by the Shell Oil Company and the discovery well of the Greeley field was completed in December, 1936, by the Standard Oil Company of California.

The complete analyses of these samples are shown on this page.

SAMPLE 37,002

KCL A Well No. A-6-29
7763-8984 at 8383 ft.
Shell Oil Co.

Ten Section Field
Stevens Sand, Zone V
Miocene

California
Kern County
Sec. 29-30S-26E MDBM

GENERAL CHARACTERISTICS

Specific gravity 0.836
Percent sulphur 0.37
Saybolt Universal viscosity at 77° F. 41 seconds
Saybolt Universal viscosity at 100° F. 38 seconds

A. P. I. gravity 37.8°
Pour point 10° F.
Color greenish black

DISTILLATION, BUREAU OF MINES HEMPEL METHOD

Dry distillation — Barometer 749 mm. — First drop: 27° C. (81° F.)

Temperature °C.	Percent cut	Sum percent	Sp. gr. of cut	°A.P.I. of cut	Viscosity at 100° F.	Cloud test °F.	Temperature °F.
Up to 50	4.2	4.2	0.660	82.9			Up to 122
50– 75	6.0	10.2	.677	77.5			122–167
75–100	3.9	14.1	.724	63.9			167–212
100–125	8.0	22.1	.748	57.7			212–257
125–150	5.8	27.9	.768	52.7			257–302
150–175	5.3	33.2	.786	48.5			302–347
175–200	4.4	37.6	.802	44.9			347–392
200–225	4.3	41.9	.820	41.1			392–437
225–250	4.9	46.8	.834	38.2			437–482
250–275	6.4	53.2	.848	35.4			482–527
Vacuum distillation at 40 mm.							
Up to 200	2.7	2.7	.867	31.7	42	15	Up to 392
200–225	4.7	7.4	.875	30.2	49	30	392–437
225–250	4.4	11.8	.892	27.1	62	55	437–482
250–275	3.8	15.6	.907	24.5	120	70	482–527
275–300	4.8	20.4	.917	22.8	230	90	527–572

Carbon residue of residuum 12.4% — Carbon residue of crude 2.6%

APPROXIMATE SUMMARY

	Percent	Sp. gr.	°A.P.I.	Viscosity
Light gasoline	14.1	0.685	75.1	
Total gasoline and naphtha	37.6	.730	62.3	
Kerosene distillate	4.3	.820	41.1	
Gas oil	16.8	.851	34.8	
Nonviscous lubricating distillate	6.8	0.876–0.902	30.0–25.4	50–100
Medium lubricating distillate	4.5	.902– .914	25.4–23.3	100–200
Viscous lubricating distillate	3.6	.914– .922	23.3–22.0	Above 200
Residuum	21.3	.988	11.7	
Distillation loss	5.1	.....	.....	

SAMPLE 37,001

KCL-11-1
7740-7807 ft.
Standard Oil Co. (Calif).

Greeley Field
Miocene Sand

California
Kern County
Sec. 19-29S-26E MDBM

GENERAL CHARACTERISTICS

Specific gravity 0.841
Percent sulphur 0.28
Saybolt Universal viscosity at 77° F. 46 seconds
Saybolt Universal viscosity at 100° F. 41 seconds

A. P. I. gravity 36.8°
Pour point 30° F.
Color greenish black

DISTILLATION, BUREAU OF MINES HEMPEL METHOD

Dry distillation — Barometer 749 mm. — First drop: 28° C. (82° F.)

Temperature °C.	Percent cut	Sum, percent	Sp. gr. of cut	°A.P.I. of cut	Viscosity at 100° F.	Cloud test °F.	Temperature °F.
Up to 50	1.7	1.7	0.652	85.5			Up to 122
50– 75	2.1	3.8	.667	80.6			122–167
75–100	5.0	8.8	.714	66.7			167–212
100–125	7.4	16.2	.741	59.5			212–257
125–150	6.7	22.9	.764	53.7			257–302
150–175	5.5	28.4	.782	49.5			302–347
175–200	4.8	33.2	.798	45.8			347–392
200–225	5.0	38.2	.813	42.6			392–437
225–250	5.5	43.7	.823	40.4			437–482
250–275	6.7	50.4	.835	38.0			482–527
Vacuum distillation at 40 mm.							
Up to 200	4.4	4.0	.855	34.0	41	15	Up to 392
200–225	5.7	9.7	.861	32.8	47	30	392–437
225–250	4.3	14.0	.875	30.2	58	55	437–482
250–275	5.0	19.0	.889	27.7	91	70	482–527
275–300	5.7	24.7	.905	24.9	170	90	527–572

Carbon residue of residuum 9.5% — Carbon residue of crude 2.2%

APPROXIMATE SUMMARY

	Percent	Sp. gr.	°A.P.I.	Viscosity
Light gasoline	8.8	0.691	73.3	
Total gasoline and naphtha	33.2	.747	57.9	
Kerosene distillate	10.5	.811	43.0	
Gas oil	15.1	.848	35.4	
Nonviscous lubricating distillate	8.7	0.865–0.891	32.1–27.3	50–100
Medium lubricating distillate	6.8	.891– .911	27.3–23.8	100–200
Viscous lubricating distillate	.8	.911– .913	23.8–23.5	Above 200
Residuum	22.7	.968	14.7	
Distillation loss	2.2	.....	.....	

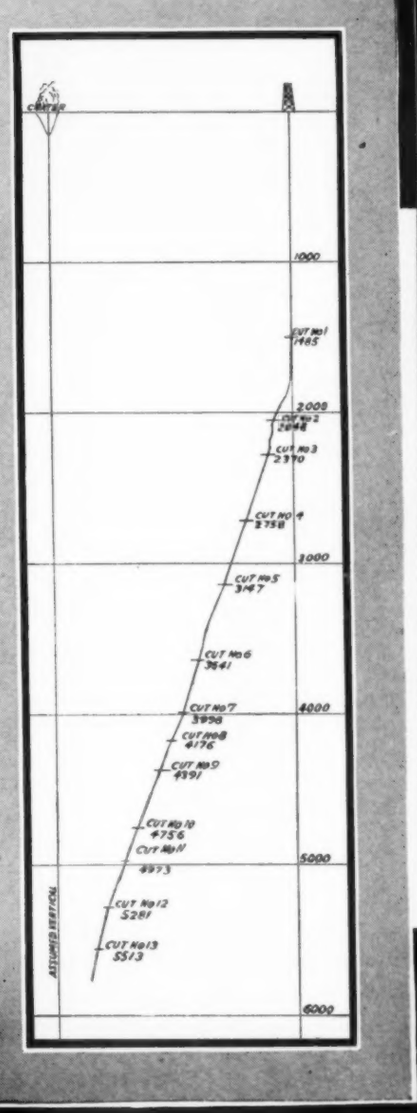
A.P.I. Delegates to World Petroleum Congress

Announcement has been made of the appointment of D. E. Buchanan, of Hanlon & Buchanan, of Tulsa, Oklahoma, as chairman of the delegates of the American Petroleum Institute to the Second World Petroleum Congress to be held at Paris, France, June 14 to 19 next. Other delegates appointed by the Institute are:

C. B. Veal, Society of Automotive Engineers, New York, N. Y.; Herbert Baxley, Socony-Vacuum Oil Company, New York; H. A. Hassan, Paris; William M. Brewster, Raffineries de Petrole de la Gironde, Paris; W. D. Crampton, Paris; Dr. C. E. Lanning, London, England; P. G. Bellemare, Compagnie Industrielle des Petroles, Paris; Phillippe Berard, Vacuum Oil Company, Paris; Dr. Gustav Egloff, Universal Oil Products Company Chicago, Illinois; Wallace Pratt, Humble Oil & Refining Company, Houston, Texas; and Dr. C. K. Francis, Oil & Gas Journal, Tulsa.

13 CUTS IN A DEFLECTED HOLE ISN'T LUCK..... IT'S

ABERCROMBIE
RED BALL
CUTTING SERVICE



It doesn't take an operator who cut his eye teeth on a Kelly joint to know the hazards of a cratered hole, nor that a burning crater is next to hell itself. But take a look-in on the job that has both of these, plus more than 5,000 feet of drill pipe stuck in the relief hole being drilled to squelch the fire. However, this is not a hard luck story . . . read on:

Barring Abercrombie RED BALL Cutting Service, cutting and removing stuck drill pipe from a normal hole has never been any cinch in itself, much less a deflected hole ranging in angle from 9 to 12° like the Sullivan field, Nueces County, Texas, job where RED BALL Service was recently called. Note in the picture the burning crater 700 feet beyond the relief well location . . . and the angle of the stuck drill pipe in the chart at the right. Note also in the chart that RED BALL Cutting Service made 13 outside cuts despite the angle at which it was necessary to work with the Abercrombie Outside Cutting Tool. All cuts were removed, and the hole cleaned, so that directional drilling could continue without obstruction.

There's Always a RED BALL Operator Ready to Solve Your Stuck Drill Pipe or Screen and Liner Job.

Running Tour
WITH MEN IN THE INDUSTRY

FRANK M. BREWSTER, JACK B. CLEAVES, and **J. A. THOMPSON,** of the Belmont Quadrangle Drilling Company, Bradford, Pennsylvania, spent several days in Houston, Texas, recently.

HAROLD DECKER, Houston, Texas, district production superintendent for Skelly Oil Company, has resigned and become affiliated with the Seaboard Oil Corporation. His headquarters will continue to be Houston.

EARNEST MERRILL, petroleum engineer for the Shell Oil Company at Long Beach, California, will leave New York July 7 for company headquarters at The Hague, Holland.

B. L. WOOLEY, M. T. HALBOUTY, ALEX R. DEARBORN, JR., and **B. W. WOOLEY** have formed the Merit Oil Corporation with headquarters in Houston, Texas. B. L. Wooley, a prominent oil man of Dallas, is president of the new company. Halbouty and Dearborn both have been with Glenn H. McCarthy, Inc., the former as chief petroleum engineer and chief geologist, the latter as head of the land and lease department, which post he will occupy with the new company. Halbouty will be petroleum engineer, geologist, vice-president, and general manager of the Merit Oil Corporation. B. W. Wooley is treasurer.

AUBREY B. SMITH, London, England, chief engineer of the Vacuum Oil Company, Ltd., has retired on pension following 32 years' service.

A. G. TANNER, general manager of United British Oilfields of Trinidad, died at sea recently. He was being returned to his home in England for treatment for a serious illness when death occurred.

C. V. SIDWELL, chief engineer for the British American Oil Producing Company, has resigned to associate himself with **JOHN LEAVELL,** independent oil operator, Tulsa.

D. K. SMITH, manager of the Globe Petroleum Company, Tampico, Mexico, recently spent his vacation in Texas and Louisiana.

ROBERT R. HAWKINS, district engineer and production superintendent of the Oklahoma-Kansas-Kentucky producing division of The Texas Company, has resigned to become a consultant in secondary recovery methods in Oklahoma and Kansas. **MARK L. TERRY,** formerly petroleum engineer, succeeds to the vacated post.

R. A. BARGER has been made superintendent of the Hurdle, Texas, district for the Humble Oil and Refining Company. He has been assistant superintendent of the district.

T. N. DAVEY recently was made manager of the Buckingham Oil Company. His headquarters are Corpus Christi, Texas. Davey at one time was with the Atlantic Refining Company.

HAROLD L. SPILLER, petroleum engineer with the Carter Oil Company, has been transferred from the South Burbank field to the Keokuk field of Oklahoma.

J. M. BRADLEY, measuring, sampling, and testing foreman for the Oklahoma Pipe Line Company, has been transferred to the Standard Oil Company of Venezuela. His new position is that of district engineer for the production department, and his headquarters will be Caripito, Venezuela.

H. T. WYATT has been placed in charge of the newly-created San Joaquin Division of the Shell Oil Company. Shell officials also announce that **W. L. BAGBY** is the new head of the Coastal Division, and **F. R. SCHMIEDER** is now in charge of the Los Angeles Basin.

H. D. DICKSON, construction superintendent in charge of the Tomball natural gas system for Humble Oil and Refining Company, has been transferred to the West Texas division office, replacing **H. N. STAMPER.**

LEE MINTER has accepted the position of chief petroleum engineer with the Belmont Quadrangle Drilling Company of Bradford, Pennsylvania. He has been production engineer for the Stanolind Oil and Gas Company in the Gulf Coast area.

ED WHITE, petroleum engineer with the Gulf Oil Corporation, stationed at Odessa, Texas, recently became affiliated in a similar capacity with the Landreth Oil Corporation.

ISAIAH LEEBOVE, president of the Mammoth Producing and Refining Corporation, has moved the general offices of the company from the Vernon field in Isabella County to Clare, Michigan. **SAM BRONSTEIN** is in charge of the Clare office.

H. D. McCRACKEN, vice-president of the Illinois Pipe Line Company, Fort Worth, Texas, retired May 1. He has been connected with the oil industry for 45 years. **R. N. MONTGOMERY,** West Texas superintendent for the company, succeeds McCracken. He will have the title of general superintendent of Texas operations.

MAURICE MELVILLE is president of the Six-Tex Oil Corporation, San Antonio, Texas, a new company. **MOWRY SMITH** and **C. R. SMITH** are the other members of the firm.

W. B. CALHOUN has been transferred by the Humble Oil and Refining Company to the East Texas division office and made division transportation foreman.

E. V. HEWITT has been transferred from Louisiana by the Pan American Production Company to Houston, Texas. He will be assistant drilling superintendent for the Gulf Coast area.

ALFRED BEST, executive department of Cia. Mexicana de Petroleo "El Aguila" S. A. at Tampico, Mexico, sailed recently for England on a vacation.

R. E. COLLOM, vice-president of the Continental Oil Company, has been re-elected president of the Kettleman North Dome Association. He will be in charge of drilling operations. **H. H. SARGENT** continues as manager of field operations. With these men in charge of activities of the association no successor will be selected for **WILLIAM REINHARDT** who resigned recently as general manager to associate himself with the oil division of the Union Pacific Railroad.

JOHN DOE & SON

INCORPORATED

Producers - Refiners

•

Dear Son:

I appreciate your deference to my long experience, but it really isn't necessary for you to consult me about material purchases now that you have selected your supply store. Few men are capable of learning except through their own mistakes, and I want you to make your share.

The list as submitted is about what I would have picked out myself. But -- have you overlooked the fact that Frick-Reid also handles steel grating?

It is a Blaw-Knox product, made by the same people who manufactured the Gas Cleaners and Tracyfiers we bought through the Frick-Reid store here shortly before you left.

Frick-Reid calls their open flooring "Blaw-Knox Electroforged Steel Grating." I prefer it for several reasons. It is the only actual one-piece grating I have ever seen. This means no slots, holes or loose parts. It is easy to paint and there is no place for dirt to collect. The clean-cut openings admit lots of light and air. The electroforging process that makes the flat bearing bars and the twisted cross bars into one piece naturally gives this grating enormous strength. Incidentally, it is safe to walk on because non-slip -- a feature your mother would appreciate, because she is forever worrying about you.

I realize that Youth is impatient of any suggestion too often repeated, and I know that you have already made satisfactory credit arrangements with your Frick-Reid store; but I do want to remind you once more that many successful men in every branch of the oil industry agree with me in my preference for Frick-Reid "Quality Products."

Sincerely,

Dad

LAUGH WITH BARNEY

Edited by BARNEY HORRIGAN

Roll Call

Sarge: Brown.

Voice: Here.

Sarge: I don't see Brown. Who answered for him?

Voice: I did. I thought you called my name.

Sarge: What is your name?

Voice: Stevenoplotski.

* * *

Mistress: You know, I suspect that my husband has a love affair with his stenographer.

Maid: I don't believe it. You're only saying it to make me jealous.

* * *

"I hear your friend Wilson has a job."

"Yeah. Ain't it a shame what some folks will do for money?"

—*Texas Ranger.*

* * *

Just because a girl has a light in her eyes doesn't mean that there's anybody home.

* * *

This may be the machine age, but love is still being made by hand.

—*Clemson Brigadier.*

* * *

Physical Impossibility

It was on top of a crowded bus in Chicago.

"Low bridge!" shouted the conductor to the passengers. "Everyone keep his seat and face to the front."

A gay little flapper up in front turned around and smiled sweetly and said, "My dear, you know that can't be done."

* * *

Wife: "How do you like my new gown? I got it for a ridiculous price."

Hubby: "You mean you got it for an absurd figure."

* * *

She: Did you ever tell a girl that you loved her before?

He: Before what?

* * *

Prof.: Is that your cigarette stub?

Fresh.: Go ahead, you saw it first.

—*Nebraska Awgwan.*

* * *

Son (who has caught his father kissing the maid): "Whatcha doin', Pop, kissin' the maid?"

Pop (thinking quickly): "Bring me my glasses son I thought it was your mother."

A young lady finding herself stranded in a small town, asked an old man at the station where she might spend the night.

"There ain't no hotel here," he said, "but you can sleep with the station agent."

"Sir," she exclaimed, "I'll have you know I'm a lady."

"That's all right," drawled the old man, "so is the station agent."

* * *

A soap company that also manufactures perfume offered a prize for a slogan. One slogan submitted that did not win the prize was: "If you don't use our soap, for heaven's sake use our perfume."

* * *

Epitaph

A nervous man was Bill Green,
Who worked upon the leases,
He kicked a can of glycerine,
And then flew all to pieces.

* * *

All Wet

A little dish of broken ice
Lay basking in the sun.
Its owner had forgotten it
Before her work was done.
But when she went to get the ice
And bring it in for tea,
She found the ice was not what it
Had been cracked up to be.

* * *

He: "Darling, I love you as no one ever loved before."

She: "Humph! I can't see any difference."

* * *

"Make it short and snappy," cried the city editor. "Boil it down."

And when they handed the new rewrite man the Ten Commandments, to try him out, he wrote:

"Don't."

* * *

It was intermission at the fraternity dance and everybody came inside to rest.

* * *

Customer: Give me some of that prepared mono-aceticacidester of salicylicacid.

Druggist: Do you mean aspirin?

Customer: Yeah. I never can think of that name.

* * *

Have you heard about the expectant father who, after hours spent in pacing the maternal ward corridor, exclaimed: "Thank God, it's a girl. I'd never want a son of mine to go through what I have today!"

* * *

The real trouble with conditions today is that half the people are waiting for their ship to come in. And the other half are waiting for their horse to come in.

* * *

Did you ever stop to think what might have happened to American history if the British soldiers at Bunker Hill had had bloodshot eyes?

* * *

A man with a rip in his pants and suspender buttons off should either get married or get a divorce.

* * *

If you think politics easy, try standing on a fence while keeping one ear to the ground.

* * *

Everyone familiar with college conduct is acquainted with the hackneyed question asked students every year. "Why did you come to college?"

Traditionally the answers match the questions in triteness. It is refreshing, therefore, to note the confiding reply of one co-ed of the University of Arizona: "I came to be went with—but I ain't yet."

* * *

"Poor old Perkins has completely lost his hearing. I'm afraid he'll lose his job."

"Nonsense. They're going to transfer him to the complaint department."

* * *

Smith: "I see that a lot of WPA workers have started a sit-down strike."

Jones: "How do they know it's a strike?"

* * *

A city chap was crossing a pasture. "Say, there," he shouted to a farmer, "is this bull safe?"

"Well," said the farmer, "I reckon he's a lot safer than you are just now."

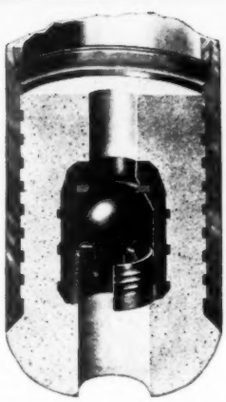
* * *

Young Thing: "Did you know I've married a man in the village fire department?"

Old Flame: "A volunteer?"

Young Thing: "No, pa made him."

You Get ALL 3 IN BAKER CEMENT EQUIPMENT



Note how the plug and valve are firmly anchored in the heavy seamless steel casing shoe.

The BAKER line of successful Cement Equipment for Guiding and Floating Casing gives you not only . . . STRENGTH • VALVE EFFICIENCY • DRILLABILITY

But affords a combination of these important factors IN PERFECT BALANCE:

STRENGTH

The heavy seamless steel shoe, into which the plug of "Baker Formula" concrete and the Bakelite valve assembly are firmly anchored, provides a unit that is stronger than the collapsing strength of the casing upon which it is run. It will float the heaviest and longest strings of casing with an ample factor of safety.

VALVE EFFICIENCY

Here is valve efficiency at its best. The valve chamber is designed with a circulation area sufficiently large to allow free passage of cement slurry, yet is small enough to provide the necessary "wash-down" action.

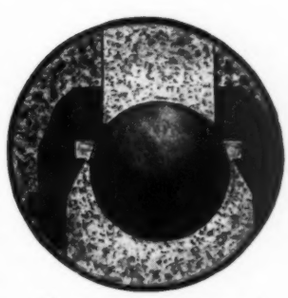
Note from the illustration at right how the buoyant Bakelite ball (which floats freely in the cement slurry) double-seals against a rubber cushion, backed by Bakelite, at the slightest reversal of pressure. Positive, instant valve action is assured.

DRILLABILITY

Complete drillability is the big feature of Baker Cement Equipment. Valve assembly and plug are constructed of Bakelite set on end in Baker-Formula concrete and both materials are easily drilled out, drilled up and circulatd out of the hole. As no metal of any description is ever used in the internal construction of Baker Guiding, Floating and Cementing Equipment, there are no dangerous fragments left in the hole to interfere with safe drilling or coring directly below shoe.

THE "BAKER BALANCE" MEANS *BETTER* RESULTS in landing Casing, Cementing, and Drilling Out.

SEE THE BAKER SECTION OF YOUR 1937 Composite Catalog for complete construction and operating details . . . or write for a Baker Catalog of your own.



Showing how buoyant Bakelite ball fits tightly on upper seat of valve assembly while casing is being floated in, or after cementing.

Detail showing design and construction of Baker Bakelite Valve Assembly. Note the large circulation passageways.

Here is complete drillability — concrete and a minimum amount of Bakelite is most easily drilled up and circulated out of the hole.

Telephone LAfayette 0153 – HUNTINGTON PARK, CALIFORNIA – 2959 E. Slauson Ave.
Telephone WAyside 2108 – HOUSTON PLANT AND OFFICE – 6023 Navigation Blvd.

MID-CONTINENT OFFICE AND WAREHOUSE:
Telephone 2-8083 – Tulsa, Oklahoma – 312 East Fourth Street

WEST TEXAS BRANCH OFFICE
Odessa, Texas – Telephone 217

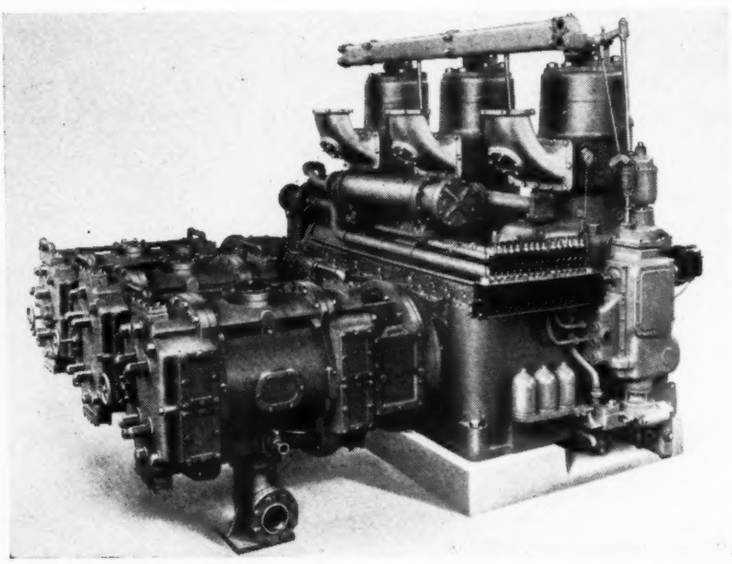
EXPORT SALES OFFICE
Rm. 1914 – 19 Rector St., New York City
Tel. Digby 4-5515

ROCKY MOUNTAIN HEADQUARTERS
Tel. 2230-Casper, Wyoming – Box 1464

BAKER CEMENT EQUIPMENT

MACHINERY and EQUIPMENT

Cooper-Bessemer Builds an Angle Compressor Unit



Cooper-Bessemer Type G-MR-3, 2-Cycle Angle Compressor Unit, rated 225 hp.

THE Cooper-Bessemer Corporation, heretofore builders of compressor units of both the horizontal and vertical types, reports the satisfactory conclusion of long tests on a combination vertical gas engine and horizontal compressor—an "angle" compressor unit —of advanced design, by which the ruggedness and dependability of the approved horizontal unit are in great measure retained, along with the compactness, quick installation, and low initial installed cost afforded by the departure.

This angle unit, known as Type G-MR, is of 2-cycle design, having two-, three-, or four-power cylinders according to requirement, the rated hp. being 75 for each cylinder and ranging, therefore, from 150 to 300. The unit is factory-assembled and tested and is so constructed, the makers state, with all power and compressor cylinders rigidly attached to a common base, that it can be shipped by rail or truck without fear of disturbing the alignment of any part. Arriving at the site, it can be set down on its prepared foundation and is almost immediately ready to operate.

"Streamline" scavenging is a distinctive point of the power-cylinder design to which the manufacturers direct attention. It is accomplished by so shaping the piston tops and the scavenging ports as to direct the flow upward from the inlet port and downward to the exhaust port, with no dead pockets anywhere between. This results, it is said, not only in complete expulsion of burned gases and replacement of fresh air but also in greatly increased turbulence by which fuel and air are perfectly mixed together for minimum fuel consumption and maximum power output.

Pressure lubrication to all bearing parts is emphasized. The piston is oil-cooled but without crossbore openings through the piston walls, by which lube oil consumption is minimized.

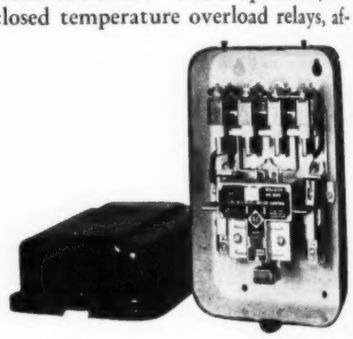
The cooling-water pump is an integral part of the unit, being driven by an adjustable V-belt from the engine. Water jackets are ample and easily cleaned when necessary.

One other advantage announced is that the engine will be convertible from gas to oil or oil to gas fuel at any time after installation.

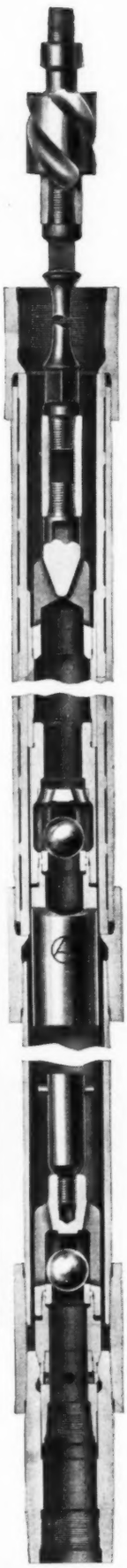
Compressor-cylinder sizes can be provided to deliver volume and pressure in any desired relation within the rated hp. capacity of the unit. The number of compressor cylinders equals the number of power cylinders and may be single or multi-stage, as required.

"Ruptor" Equipped Air Motor-Starter

THE Allis-Chalmers Manufacturing Company, Condit Works, Boston, Massachusetts, announces a new type across-the-line air motor-starter, equipped with "Ruptors," known as type AP-7. The "Ruptors" are enclosing chambers that confine and depotentiate the arc formed by circuit interruption. These "arc-depotentiating chambers" greatly increase the interrupting ability of the contacts, and form an isolating barrier between contacts of opposite polarity. Other features include: vertical make and break—silent operation; enclosed temperature overload relays, affording positive motor protection; unit construction—pole units consisting of individual molded bases mounted on a steel chassis, thus assuring true constant alignment; large silver double-break contacts—no contact dressing needed; contacts accessible and quickly renewable; pilot circuit isolated from motor circuit, permitting a separate control voltage for push-button circuit where necessary; motor-starter unit arranged for flat surface mounting when applied without enclosure. The starter is supplied for 7½ hp. at 440 and 550 volts, 5 hp. at 220 volts, and 3 hp. at 110 volts.



...THIS IS THE PUMP *that founded an industry*



AND TODAY IT'S MORE POPULAR THAN EVER

One of Axelson's first developments 45 years ago was the the Top Collar Both Ends Pump, designed to produce oil effectively, economically, and with minimum operating difficulties. The Top Collar Both Ends Pump has never failed to meet every challenge.

With the passing years other styles of pumps have been developed by Axelson. Some of these pumps have been designed to handle deep pumpers with limited production, others to handle shallow wells with large volume of fluid, still others to specifically meet sand, gas, electrolysis, and corrosive conditions. Notwithstanding these other types of pumps, all leaders in their respective classifications, the Top Collar Both Ends Pump remains the old "stand-by" for all around utility service. Its multiplicity of combinations, its varied bore and stroke, make it adaptable to the majority of pump-operated wells. All parts of Axelson Top Collar Both Ends Pumps are interchangeable and conform to A.P.I. specifications.

Many Combinations Available for this Assembly

Liners
- Regular
- Hard Iron
- S. S. Hardened Steel
- Nitri-cast-iron

Plungers
- Regular
- Grooved
- Chromium Plated
- S. S. Hardened Steel
- Perry
- Barnwell
- and any combinations of these types

Seats & Balls
- Axloy
- X-L
- Durax
- Acme

Plain or upset API tubing threads

THE AXELSON
TOP COLLAR BOTH ENDS COMPLETE TUBING SECTIONAL LINER PUMP

With Plunger Bottom Valve and Standing Valve

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

AXELSON MANUFACTURING COMPANY

P. O. Box 710, Vernon Station, Los Angeles • St. Louis • 50 Church Street, New York • Tulsa • *Mid-Continent & Eastern Distributor:* Frick-Reid Supply Corporation • *Rocky Mountain Distributor:* Great Northern Tool & Supply Co.

AXELSON DEEP WELL PLUNGER PUMPS — SUCKER RODS

Electrode Designed Specifically for Fillet Welding

A NEW electrode that eliminates necessity of multiple-pass welding in production of fillet and lap welds in many applications, and which permits production of such welds without undercutting or overlap, is announced by The Lincoln Electric Company, Cleveland, Ohio. Fillet welds up to ⅜-in. size with one plate vertical, can be produced in one pass with the electrode. The welds show no undercutting at the vertical plate and no overlap at the horizontal plate, it is stated.

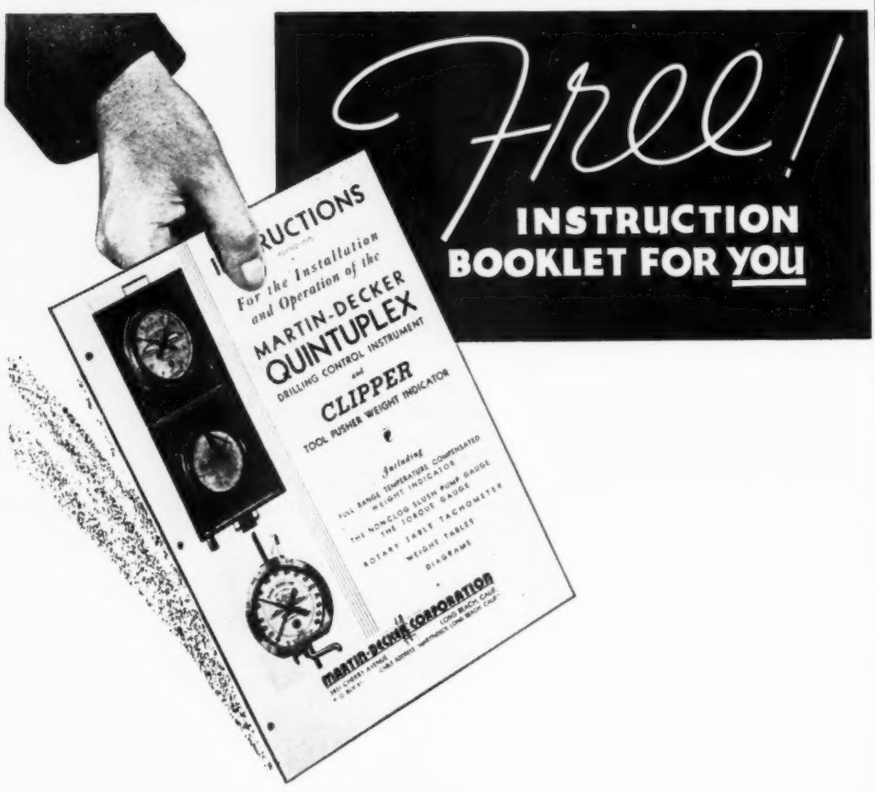
Fillet welding with new Lincoln "Fleetweld 8" electrode, developed specifically for producing high-quality fillet welds at improved speed and economy

Fillet welds of any size can be made more easily, of better quality, and at higher speed with the electrode than heretofore was possible, the manufacturers say.

The new electrode, designated as "Fleetweld 8," is the result of considerable research and experiment by Lincoln engineers to develop an electrode that would simplify fillet welding and improve its quality and economy.

The new electrode is heavily coated for welding by the shielded-arc process. The welds produced are smooth and dense with notably high physical properties. The tensile strength of the weld metal as deposited is 68,000 to 72,000 lb. per sq. inch. Ductility is 20 to 30 percent elongation in 2 in. as deposited, and 30 to 36 percent stress relieved. Other properties, including resistance to fatigue, impact, and corrosion, are equal to or better than mild steel.

"Fleetweld 8" comes in 14-in. and 18-in. lengths. The 14-in. lengths are made in ⅜-in. 5/16-in. ¼-in. 3/16-in., and 5/32-in. sizes, while the 18-in. lengths come only in the ⅜-in. 5/16-in., and ¼-in. sizes.



There's a wealth of information in this new booklet! Twelve pages, completely illustrated, give interesting tips on the maintenance and servicing of QUINTUPLEX and CLIPPER Drilling Control Instruments. It's designed to help *you* get the most out of your Martin-Decker control equipment, so send for it *today* before you forget. They're free!

MAIL THIS COUPON

MARTIN-DECKER CORPORATION
3431 CHERRY AVE., LONG BEACH, CALIF.

Send me one of your new instruction booklets on the QUINTUPLEX and CLIPPER.

*Name*_____

*Address*_____

*Company*_____ *Position*_____

Hour Meter for Diesel Tractors and Engines

HENCEFORTH an hour meter will be standard equipment on all 3-, 4-, and 6-cylinder Diesel engines produced by the Caterpillar Tractor Company, according to an announcement made recently.

The hour meter is a sturdy, durable unit with a large dial that is easy to read. It is attached to the rear of the fuel-injection pump housing and is driven by the end of the shaft, fitting between the heads of the cap screws in the end of the fuel-injection pump camshaft. The hour meter registers one number for every hour the engine operates at standard rated speed.

YOUR FUTURE CASING PROFITS

THE wise operator keeps in mind the "long pull" for profits. He knows that short-cuts and chances can easily wreck the most promising outlook. He works accordingly, gives careful, thoughtful consideration to each step, scrutinizes every material used, large and small, weighing values, pondering ultimate life and economy.

Casing, the biggest single material expense of the well, comes in for extra close attention. Emergencies sometimes arise in running and cementing — leaky joints may develop — lack of uniformity in casing ends may cause loss of time and labor in make-up. These and other features will largely determine the ultimate profits from the well.

Take no chances — play safe, specify NATIONAL Seamless. Pierced from solid steel, uniform wall-strength is assured. It cannot split at any place along a weld a mile or more down; it has no welds. Carefully finished ends mean that it stabs easily, screws together smoothly and accurately. In your next well, buy your future casing profits now, be sure to specify NATIONAL Seamless A. P. I., Diamond B X and B 8,

America's Preferred Casing, made by the world's largest manufacturer of steel pipe and tubes.

NATIONAL
Seamless Casing

X A.P.I. 8

NATIONAL TUBE COMPANY

PITTSBURGH, PA.

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Emsco Line of Tractor Equipment

THE name "Emsco," long familiar to oil men, is now to be found on a complete line of cable- and hydraulic-controlled tractor equipment, according to a recent announcement by the Emsco Derrick and Equipment Company of Los Angeles, California.

In its new field of manufacture the Emsco Derrick and Equipment Company has brought together a number of newly-developed units and an established line of construction machinery. Comprising the Emsco line are the widely used bulldozers, trailbuilders, and power control units formerly produced by the Hutchins Winch Company and the new Emsco-developed hydraulic equipment.

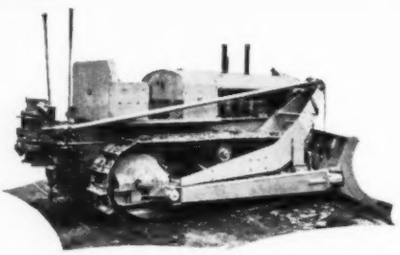


Fig. 1

The Emsco cable-controlled trailbuilders and bulldozers are constructed for all popular size tracklaying tractors. Illustrated here are an Allis-Chalmers model trailbuilder (Fig. 1), and a Cletrac model Emsco bulldozer (Fig. 2). These units embody many unique

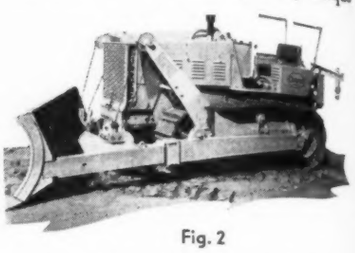


Fig. 2

patented features that users have received enthusiastically because of the resultant low upkeep cost, minimum cable wear, and smooth, fast blade operation.

All Emsco cable-operated units are powered by the highly-effective Emsco power control units, which are manufactured in both single- and double-drum type. The latter is shown in Fig. 3.

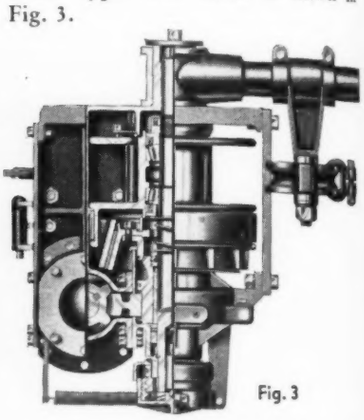


Fig. 3

All inquiries regarding this equipment should be addressed to Emsco Derrick and Equipment Company, 332 South Michigan Avenue, Chicago, Illinois, or 6701 South Alameda Street, Los Angeles, California.

TRY AND BEAT THIS LINING FOR WEAR!

THIS RIG, owned by the firm of Golden and Farris, and being used in the Corpus Christi oil fields, Texas, was re-equipped with J-M Giant Rotary Lining, Style 410. The superior, dependable service of this unusually durable material assures continued high braking effectiveness here and on all similar rigs.

You get all these advantages on your drilling rigs—with J-M Lining, Style 410

AN EVEN FEED-OFF
. . . assuring better controlled drilling.

LESS SMOKING AND DUSTING
. . . working conditions greatly improved.

SCORING TENDENCY REDUCED
. . . life of brake rim is lengthened.

QUIETER BRAKES
. . . less nerve strain on drilling crews.

Johns-Manville
GIANT ROTARY LINING
Style 410

FOR FULL DETAILS on the complete line of J-M Friction Materials, address Johns-Manville, 22 East 40th Street, New York City.

Goodrich Introduces Prenite 20M Asbestos Sheet Packing

A NEW sulphur-free, Neoprene-bonded, compressed asbestos sheet packing, known as Prenite 20M, has been announced by The B. F. Goodrich Company, Akron, Ohio. This new packing offers increased resistance to oil as well as to such refrigerants as freon, methyl-chloride, and sulphur-dioxide. Absence of sulphur in its composition makes for a packing that will not corrode metal parts, the manufacturers state.

Prenite 20M sheet packing is available in 50-in. by 50-in. sheets in 1/32-in., 1/64-in., and 1/16-in. thicknesses.

TO ALL

Natural Gasoline Men

Greetings

FROM THE

NATURAL GASOLINE SUPPLY MEN'S ASSOCIATION

We are looking forward to seeing
you at the

SIXTEENTH ANNUAL CONVENTION
of the
NATURAL GASOLINE ASSOCIATION OF AMERICA

May 19-21, Hotel Tulsa
Tulsa, Oklahoma

MEMBERS

The Brown Instrument Company
Burrell-Mase Engineering Company
The Bristol Company
Chaplin Fulton Manufacturing Company
Chicago Bridge and Iron Works
Clark Brothers Company
Continental Supply Company
Cooper Bessemer Corporation
S. R. Dresser Manufacturing Company
The Fisher Governor Company
The Foxboro Company
Frick-Reid Supply Corporation
Goulds Pumps, Inc.
Hanlon-Waters, Inc.
Hercules Motors Corporation
Ingersoll-Rand, Inc.
Mason-Neilan Regulator Company
C. A. Mathey Machine Works
Mattison-Wallack and Company
Metric Metal Works
Midwest Piping and Supply Company
Moorlane Company
National Petroleum News
National Supply Company
National Tank Company
Naylor Pipe Company
North American Car Corporation
The Oil and Gas Journal
Petroleum Engineering, Inc.
The Petroleum Engineer
Pittsburgh Equitable Meter Company
The Refiner and Natural Gasoline Manufacturer
The Refinery Supply Company
C. J. Tagliabue Manufacturing Company
Taylor Instrument Company
Tulsa Boiler & Machinery Company
Victaulic Company of America
Vinson Supply Company
Webster Engineering Company
Westcott & Greis, Inc.
Woobank Pump & Machinery Company
Worthington Machinery Corp. of Oklahoma
Wyatt Metal & Boiler Works
John Zink Burner Company

Get 100% Results with a 100% Spang String!

No ordinary "mixture" of cable tools can give you the good results you get with a complete SPANG string.

Spang "Higher Standard" cable tools give you *balanced uniformity* . . . through use of the finest metals . . . through precise machining and correct heat-treating.

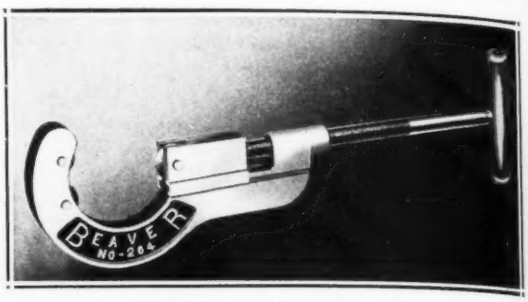
Spang Tools reduce costly delays and shutdowns . . . and so, get you down to pay dirt faster and more economically. Specify Spang for the entire string! Spang & Company, Butler, Pa.

Our forty-three years of experience in cable tools is yours for the asking. Consult us about any cable-tool problem that arises.

Specify SPANG
"HIGHER-STANDARD"
CABLE TOOLS

Beaver Square-Built Wheel Cutters; Alloy Tool-Steel Reamers

SQUARE-BUILT wheel cutters, made by Beaver Pipe Tools, Inc., Warren, Ohio, are manufactured in two types, the No. 102, ⅛ to 2 in., having one or three wheels, and No. 204, 2½ to 4 in., having three wheels only. The



No. 204 square-built wheel cutters

equipment is made of malleable iron to withstand severe abuse. Three types of wheels are available: (1) standard pipe, (2) cast-iron pipe, and (3) thin-wall tubing. Wheels and rollers are standard and interchangeable with other tools.

Alloy tool-steel reamers are manufactured by the same company in the swivel type and the ratchet type. No. 200 is the swivel type—⅛ to 2 inch. No. 300 is the ratchet type—⅜ to 3 inch. The reamer cone is a solid casting of the highest grade alloy tool-steel, it is stated by the makers. There are no inserted blades to come loose. It can be resharpened again and again and when finally worn out can be replaced. A large "hand grip" permits application of pressure with ease.

Alloy tool-steel reamers

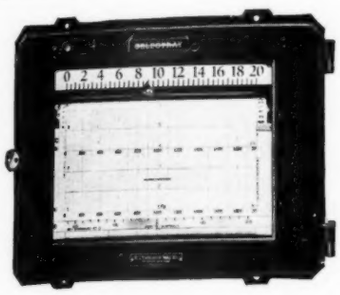
McNeely Mud Screen

VERNON Tool Company, Ltd., Los Angeles, California, announces a new McNeely vibrating mud screen, known as Model E, said to more than meet the needs of the oil industry for a dependable supply of clean, plastic drilling fluid at lowest operating and maintenance costs. Features of the McNeely vibrating mud screen include superstrength for rough service; completely unitized design for easy handling in the field, and a curved screen surface (exclusive) that increases capacity and lengthens screen life. According to the manufacturer, the new McNeely vibrating mud screen has an average capacity of 650 gal. of drilling fluid per minute, equal to the output of the largest mud pumps. Vibrating frame and screen cloth are divided into two sections, thus only one-half the cloth need be replaced at one time. Each half is independently tensioned and new cloth is easily installed and stretched taut, it is stated.

Copies of Bulletin No. 101 may be obtained from Vernon Tool Company, Ltd., 2740 East 37th Street, Los Angeles, California, or McNeely Materials Company, 2935 Jensen Drive, Houston, Texas, Gulf Coast and Mid-Continent representatives.

Photoelectrically Balanced Potentiometer

THE C. J. Tagliabue Manufacturing Company, Park and Nostrand Avenues, Brooklyn, New York, has announced a new recorder called the Celectray. In this new type recorder, a sensitive mirror galvanometer is the primary controlling element in which an inertialess beam of light replaces the



customary metal boom or pointer. The beam of light from the galvanometer in moving on and off a phototube passes the "controlling edge" of a screen, thus operating relays that in turn control a reversing motor that drives the moving contact of the Wheatstone bridge or potentiometer. The phototube is not a calibrated element but serves only to detect the direction of the lightbeam and bring the galvanometer to zero deflection, according to the well-known null method of balancing an electric circuit. The new instrument, therefore, is not a "photoelectric potentiometer" in the sense that a balance of photoelectric current is implied.

It is evident that the galvanometer is free at all times from mechanical engagement, and this fact, together with its low moment of inertia, permits rapid balancing and control actions. Furthermore, a high current sensitivity is available, permitting the use of high resistance, or of very long thermocouple leads without material loss of accuracy in the balancing, the manufacturers state; or, on occasion, a very low scale range does not require the use of a very low resistance and its resultant disadvantages.

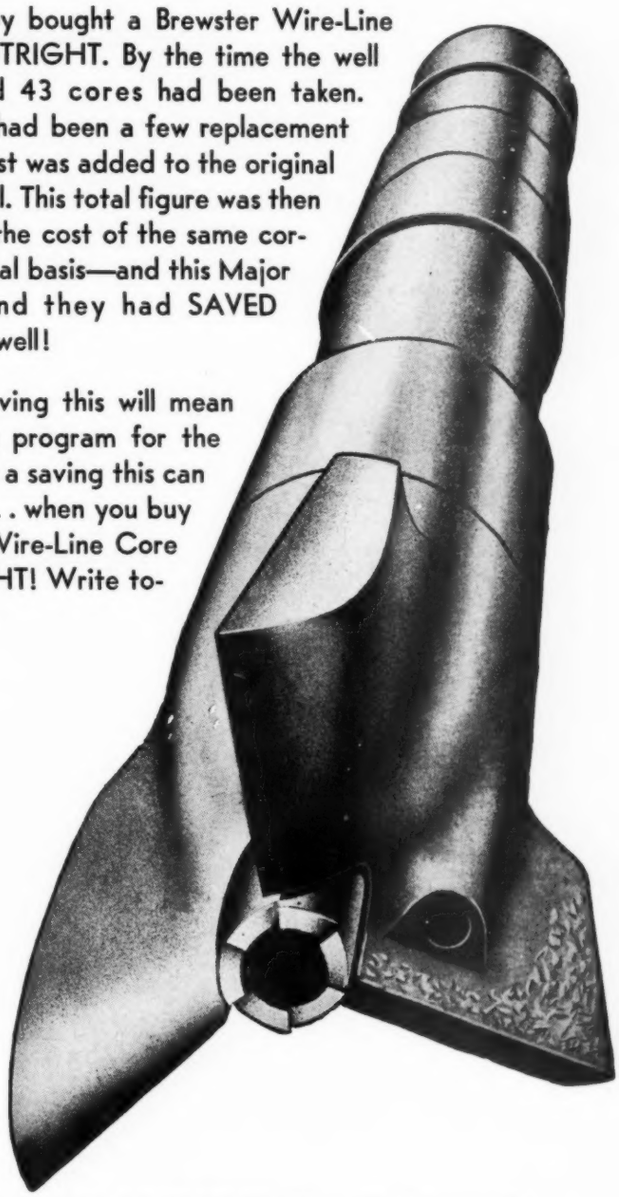
In the Celectray the problem of stopping a moving light-beam on the edge of a photoelectric cell with speed and precision has been solved for the first time, it is stated. This solution has resulted in the elimination of many parts from the previous models and has increased the available speed of recording. Numerous kinds of recorder-controllers, recorders, and indicating controllers or resistance-thermometers, as well as thermocouples and other electrical devices, are available.

$430.00 SAVED
On One Well!

One hard-headed Major Company that keeps accurate records of all their costs handed us an expense-log of a well they have just completed.

For this well they bought a Brewster Wire-Line Core Barrel OUTRIGHT. By the time the well was completed 43 cores had been taken. Naturally there had been a few replacement parts and the cost was added to the original cost of the Barrel. This total figure was then compared with the cost of the same coring job on a rental basis—and this Major Company found they had SAVED $430.00 on the well!

Think what a saving this will mean on their drilling program for the year. Think what a saving this can mean to YOU . . . when you buy your Brewster Wire-Line Core Barrel OUTRIGHT! Write today for prices.



The BREWSTER CO. Inc.

Houston, Texas Longview, Texas Corpus Christi, Texas Houma, La.
Rodessa, La. New Iberia, La. Lake Charles, La.

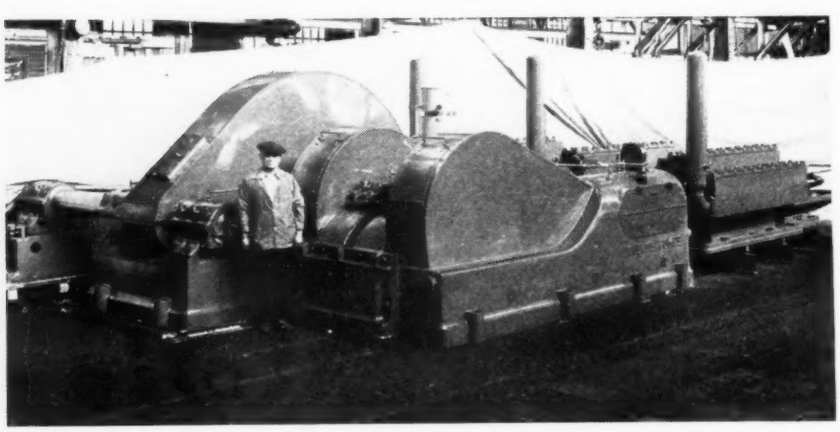
Export Office: Acme Well Supply Co., 136 Liberty Street, New York City

PHONE 3181 SHREVEPORT, LA.

BS&B Bolted Steel Mud Tanks

WHEN limited space in the Oklahoma City field forced producers to find a substitute for the slush pit the "Perfection V.P." bolted steel tank manufactured by Black, Sivalls and Bryson, Inc., Oklahoma City, Oklahoma, was offered. This tank, with its low, stiff staves, proved to be a design singularly suited for the purpose. It has since been found that these tanks may be used economically in any field. The manufacturers point out that they require less water than earthern ponds because there is no seepage, and this lack of seepage also makes for better control of drilling mud. They require less space, can be moved many times, and can be used with any rig that has a substructure.

Largest Oil Pipe Line Pump



GOULDS PUMPS, Inc., Seneca Falls, New York, has just completed construction of the largest oil pipe line pump ever built in this country. It is being shipped to southwestern oil fields where it will be put into immediate service.

The huge pump, of the horizontal triplex double-acting plunger type with a 38-in. stroke, weighs approximately 75 tons. Capacity is 58,000 bbl. of oil daily, almost 2½ million gal. every 24 hours.

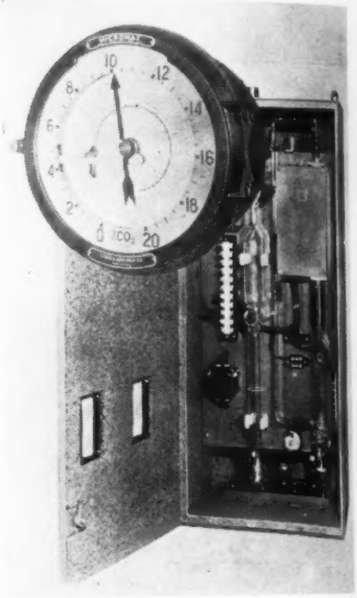
The pump has three cylinders, each weighing 9400 lb., machined out of a solid-steel forging. The gear wheel is of 9-ft. 2-in. diameter and weighs 8500 lb., while the pinion shaft and drive shaft diameters are 10-in. and 12-in., respectively.

The center frame casting, weighing more than ten tons, is the largest casting ever poured in the foundry of the Goulds plant. It is approximately 13½ ft. long, 5 ft. wide, and 4½ ft. high. Three flat cars were required to ship the pump.

Work has been started on a second pump of the same size, to be shipped within the next few weeks.

Micromax CO_2 Recording Equipment

USING a simplified cell assembly that conditions a flue-gas sample by saturating rather than by drying it, equipment is announced by Leeds & Northrup that the manufacturers state offers steam plants high accuracy and quick response in continuous CO_2 recording, with low maintenance. The makers believe that overall performance is so improved that a far larger number of engineers responsible for combustion efficiency will now find it both economical and satisfactory to measure CO_2 continuously by the thermal-conductivity method, either to guide manual regulation, or to check the correctness of automatic control.



Round-Chart Micromax CO_2 recorder and saturated-gas cell assembly

For details write Leeds & Northrup, 4934 Stenton Avenue, Philadelphia, Pennsylvania, for Catalog N-91-163.

It is attractively finished and protected from the elements on the outside with a heavy coat of metal enamel. The inside is finished with rust-proof aluminum paint.

WHERE DEPENDABILITY CANNOT BE OVERLOOKED

Nothing conspicuous; nothing to catch your eye and make you stop; but there on the job serving you day and night — sure, reliable, accurate — are the dutiful Chaplin-Fulton Regulators. They show best where dependability is not to be overlooked.

Because you can be sure of Chaplin-Fulton constancy: that's the reason Chaplin-Fulton Regulators have led in all regulation service for over fifty years.

THE CHAPLIN-FULTON MFG. CO.
28-40 Penn Ave. Pittsburgh, Pa.

CF

Chaplin-Fulton 2" Low Pressure Cut-off Regulators on fuel line to compressors at Fairfax, Okla.

FOR
Bad Sand Conditions

We Enthusiastically Recommend

B-M-W Tex Type Working Valves

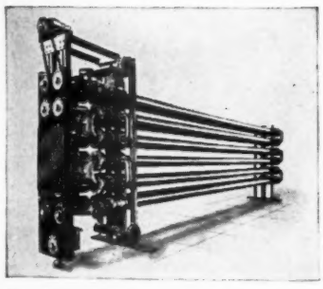
for common barrels, and we recommend TEX TYPE Plunger Fittings for insert pumps. As the illustration indicates, this valve is an assembly of a large number of Composition Rings separated by metal washers. Adapts itself readily to the tube in which it works. Tests prove that 5 to 13 per cent more fluid is pumped per hour through an exceptionally long life. Try them and you will be convinced. They, and other principal B-M-W Products are

OBTAINABLE AT SUPPLY STORES:

• TEX TYPE Plunger Fittings and Valves; • ADMORE Insert Pump Anchors; • NEILSON Tools (Safety Sucker Rod Hooks, Tubing Hooks, Rod Elevators, Sucker Rod Sockets, etc.); • BALLS and SEATS (made for every pumping service); • ADMORE Liner Barrels; and • COLLINS Belt Clamps.

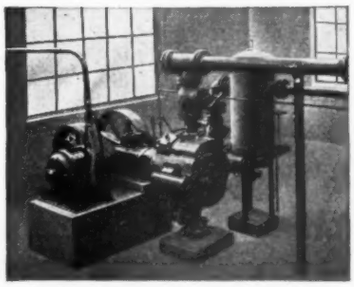
BRADFORD MOTOR WORKS INC.
OIL WELL SUPPLIES
BRADFORD, PA. — TULSA, OKLA.

1937 MODERN EQUIPMENT for 1937
REFRIGERATION and DEWAXING



Carbondale Heat Exchanger

Now is the time to prepare for next season's requirements.



Horizontal Booster, in refinery service

COMPRESSION REFRIGERATION SYSTEMS
Single and 2-Stage
ABSORPTION REFRIGERATION SYSTEMS
FILTER PRESSES

Carbondale engineers, with a background of 40 years of refinery refrigeration experience, stand ready to discuss your needs.

Ask for bulletins

CONDENSERS AND BRINE COOLERS
OIL COOLERS AND HEAT EXCHANGERS
CHILLING MACHINES
for Distillate and Solutions

CARBONDALE
DIVISION
CA7-8
WORTHINGTON PUMP AND MACHINERY CORPORATION

ATLANTA BOSTON BUFFALO CHICAGO CINCINNATI CLEVELAND DALLAS DENVER DETROIT EL PASO HOUSTON KANSAS CITY

General Offices: HARRISON, NEW JERSEY

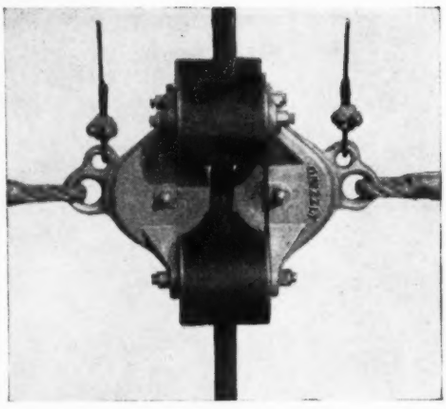
Representatives in Principal Cities of Foreign Countries

LOS ANGELES NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH ST. LOUIS ST. PAUL SAN FRANCISCO SEATTLE TULSA WASHINGTON

Grizzly "No-Wip" Line Saver

THE latest member of the well-known "Grizzly" line of oil field products is the Grizzly "No-Wip" Line Saver. This new device is identified by the manufacturer as neither a line spooler nor a rigid line guide, but a "line saver." Its unique design is indicated by the accompanying illustration.

The Grizzly "No-Wip" Line Saver was engineered for the specific purpose of eliminating the expense and hazards of excessive wire line wear. These benefits are effected through a mode of operation that is very simple



and that at the same time results in trouble-free functioning and long life on the part of the device itself, according to the makers.

In passing through the "No-Wip" Line Saver, the wire line comes in contact only with six rubber rollers, at no time touching metal. The top and bottom rollers take out the whip—without straightening or injuring the line—while the side rollers help spool the line perfectly. At no time is there any friction, stress, or strain on the line, as the device floats with the line and the rollers spin freely at the slightest contact. This free-spinning action results from the incorporation of two "Norma-Hoffman" precision-ground ball bearings in each roller, the bearings being packed in a Norma special stability grease.

The device can be installed at any point in the derrick, at any height over the drum, and regardless of where or how installed it functions perfectly at any angle. It is only necessary to remove four bolts to install.

The Grizzly "No-Wip" Line Saver is manufactured by the E. M. Smith Company, 600-650 South Clarence Street, Los Angeles, California, and is distributed by leading supply companies. A complete description of the device may be obtained by requesting Bulletin No. 10-OF.

Oil Suction and Discharge Hose With Aluminum Wire and Fittings

A NEW oil suction and discharge hose incorporating aluminum wire and fittings has been introduced by The B. F. Goodrich Company, Akron, Ohio. This hose, known as Type 200, was developed for those users who prefer the aluminum construction because of its lighter weight and non-corrosive qualities, the makers state.

Type 200 oil hose is a rough bore construction, having a flat internal aluminum wire and a flat secondary aluminum wire. To compensate for the reduction in bursting strength, which occurs with the substitution of aluminum wire for steel, additional plies of fabric are added to the carcass. The hose is made with a heavy rubber cover that, besides being oil-resisting, affords maximum resistance to abrasion.

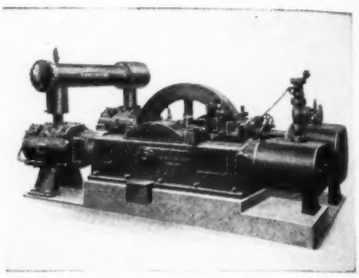
All fittings supplied with this hose are of aluminum.

Type 200 oil hose is available in sizes ranging from 4 to 10 inches.

Improved Opposed Steam-Driven Compressors Offered by Worthington

DUAL cross-head design, tie-rods that maintain all piston strains in exactly the same line with the connecting rod, a uniform flywheel and counter-weighted running gears, are featured in the improved line of horizontal heavy-duty steam-driven compressors offered by Worthington Pump and Machinery Corporation, Harrison, New Jersey.

These compressors embody the simple light-weight feather-type valves that characterize all Worthington compressors and for which important advantages are claimed. Suction and discharge valves, situated in the cylinder body, permit the full area of the cylinder head to form a water jacket, which cools the air and valves, in addition to keeping the valves free of carbon. Low power consumption is claimed because of the Admirality metal tube inter-coolers.

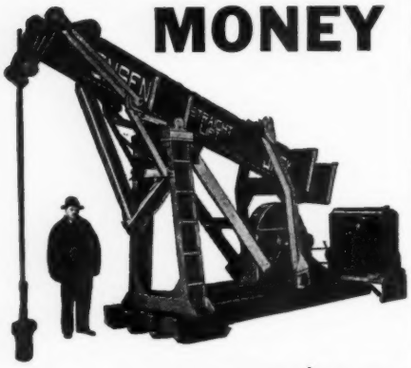


Early cut-off, provided by double-piston steam valves with adjustable riding cut-off valves, results in high steam expansion. The point of cut-off can be controlled either manually or by a governor. The automatic cut-off governor that is provided may be arranged as a speed-and-pressure or variable-speed type.

All bearing surfaces are force-feed lubricated, and low oil operating temperatures are assured by a lubricating oil cooler in the line. Duplicate pumping equipment is provided so that each side of the compressor is lubricated independently of the other.

A well-illustrated 20-page bulletin, containing complete details, may be had by writing the manufacturer. Ask for L-612-B3.

YOU SAVE MONEY



. . . every day you operate a JENSEN Straight-Lift JACK.

Anyone can say that about any pumping unit — but we'll furnish PROOF when you are ready to hear the JENSEN story.

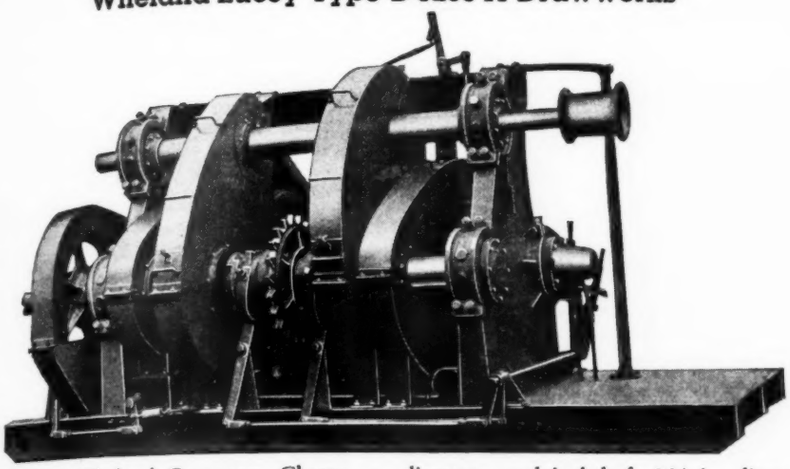
Successful producers have co-operated with us for 19 years in perfecting pumping equipment. JENSEN has come to mean economy and efficiency.

See your JENSEN *Dealer—or wire us at Coffeyville*

JENSEN BROTHERS MANUFACTURING CO.

. . . Coffeyville, Kansas

Wheland-Lucey Type B-3200-A Drawworks



THE Wheland Company, Chattanooga, Tennessee, offer a new Wheeland-Lucey drawworks featuring oil-tight chain housings that form oil reservoirs, and through which chains run constantly. Advantages of this feature are greatly increased life of chains and sprockets, the makers state.

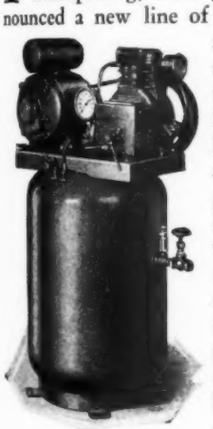
It has three shafts and sprockets and clutches are so arranged that four hoisting speeds and two rotary table speeds are available. The drum shaft is 8-in. diameter, lineshaft 7½-in. diameter, and jackshaft 7½-in. diameter. All shafts are mounted on heavy-duty American Roller Bearings.

Completely unitized, side housings are solid cast steel with bearing boxes cast integral. This sturdy construction minimizes vibration and assures perfect alignment, it is stated.

Brake flanges are water-cooled and brakes are standard Wheland-Lucey compounded-type designed to hold the longest strings of pipe with minimum effort on the part of the operator.

Fractional Hp. Air Compressors

INGERSOLL-RAND Company, Phillipsburg, New Jersey, has announced a new line of fractional hp. air compressors. These units are made in ¼- and ½-hp. sizes. They are very compact and neat in appearance, with automatic start and stop control, are equipped with a new style seamless steel tank, and an improved check valve.



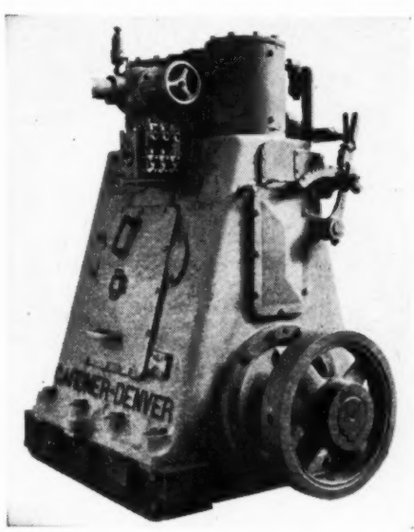
When supplied for single-phase current they are equipped with a brushless capacitor-type motor and a built-in automatic protection switch giving overload and under-voltage protection. They are rated for 150 lb. per sq. in. maximum pressure, but may be set for lower pressures, or may be equipped with a reducer valve for still lower pressures.

The ¼- and ½-hp. units are available on a 2.4-cu. ft. tank, which is illustrated. This unit is less than 35 in. high. The ½-hp. size also is available on a 4.6-cu. ft. tank in either vertical or horizontal mounting. If desired the units can be supplied less the tank. The units are finished in an attractive opalescent brown.

Literature is available on request.

Gardner-Denver Vertical Steam Drilling Engine

GARDNER-DENVER Company, Quincy, Illinois, announces a new vertical twin-cylinder steam drilling engine, a compact and economical unit suitable for driving the rotary table directly, at the same time having sufficient power to serve as a standby for driving the drawworks. The engine also is suitable for driving a mud pump, by means of V-belts, flat belt, or chain drive.

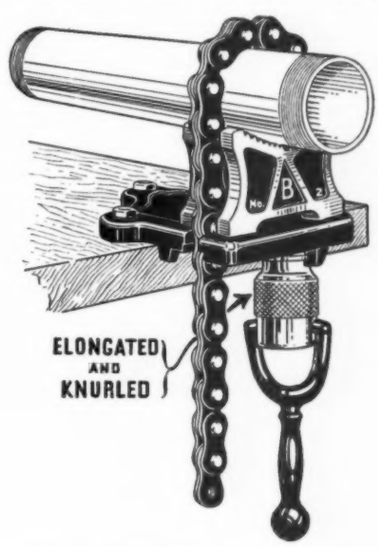


The engine is reversible and is of the adjustable cut-off type. Cut-off is adjusted manually and is easily set to meet load requirements. Steam valves are of the inside admission piston-valve type; light, perfectly balanced, and easy to reverse. The valves are tight under high pressures and with superheated steam. The steam cylinders are insulated with mineral wool covered by sheet steel.

Improved Chain Pipe Vise by Billings

A NEW construction feature—the heavily knurled and elongated adjustment nut.

This new Billings feature provides a gripping surface for more rapidly taking up the slack in the chain. A partial turn of the handle is sufficient to clamp the pipe. Interference between the handle and the bench is avoided.



This improved chain pipe vise with the exclusive Billings knurled adjustment nut is made entirely of steel. The base, handle, and jaws are drop forged, the latter from special analysis tempered steel, scientifically heat-treated. The chains are heavily constructed for rugged work.

The vise is light in weight yet the drop-forged construction insures maximum strength, the makers state. Made in four sizes with capacities from ⅛-in. to 8-in. pipe.

Literature giving complete detail will be sent upon request. Address the Billings & Spencer Company, Hartford, Connecticut.

Sucker Rod Stripper

A NEW sucker rod stripper has been placed on the market by The Guiberson Corporation, Dallas, Texas. Purpose of this tool is to strip the oil and paraffin from the sucker rods and couplings and to prevent the escape of gas and oil when the rods are being run in or out of the well. It is said to make the nastiest "wet job" cleaner than any regular well-pulling operation.

The tool provides a leak-proof seal under pressure. It is rated at 400-lb. working pressure and sucker rods have been pulled successfully without loss of oil or gas under pressures exceeding 400 lb., it is stated. This makes it possible to remove safely and easily the sucker rods from a well that has started flowing after being brought in on the pump, or a well with a large amount of gas that has a tendency to build up heads and flow intermittently. The rubbers providing the pack-off are extremely flexible and if necessary will allow the passage without leakage of any pump, pump plunger, or sucker rod splicers that can be run in 2½-in. tubing.

The device consists of but four parts and it is pointed out that there are no pins, bolts, or other small pieces that can cause trouble easily. The rubber is in halves and is inserted in the housing. A compression plate goes over the rubbers inside the housing; the

cover plate screws onto the housing by means of a coarse thread and compresses the rubber, sealing it around the rod as well as the inside of the housing. The cover plate is provided with holes into which a bar or chain tong handle may be inserted to facilitate screwing it down on the housing.

The face of the rubber contacting the sucker rod, as well as the outside of the rubber that contacts the housing, is deeply fluted horizontally, or circumferentially, which gives it the wide range of expansion and contraction necessary. Two sizes of rubbers are available.

New Armstrong Wrenches Built for "Abuse"

WRENCH manufacturers have long complained that users abuse wrenches—put pipe over handles to increase leverage, or pound wrenches with hammers if the nut or cap screw will not give with the first pull.

Now comes Armstrong Bros. Tool Co., "The Tool Holder People," Chicago, Illinois, with a new line of heavy-duty drop-forged, alloy-steel, box-socket wrenches, not only built for "abuse" but equipped with "abusing" accessories. Provided in this line, comprising "straight," "offset," and "angle" types with openings from 1¼ in. to 3½ in., are long tubular extensions that slip over the forged handle and permit leverages up to 30 to 1, and "striking sleeves" that are designed to protect handles when "loosening or setting nuts in close quarters with a hammer or sledge."

COOK'S GRAPHITIC IRON PISTON RINGS

are first choice for difficult jobs!

Where rings of superior wearing properties are needed to meet conditions of poor lubrication, extreme pressures and high temperatures, COOK'S Rings get the call.

- **They're the accepted standard in the Petroleum Industry for Natural Gas Pumping Engines—Gasoline Extraction Units—Oil Pipe Line Engines.**
- **They're serving successfully in Steam Engines working under a total pressure of 1840 pounds at 797° F. total temperature—the only rings adequate to the conditions.**
- **They predominate in the Diesel Trade because they increase cylinder life as much as 50%—restore new engine performance—improve over-all efficiency.**
- **In Ammonia Compressors and similar services where lubrication is a problem, COOK'S Rings have repeatedly proved they have longer life and retard cylinder wear.**

Don't accept undue cylinder wear—frequent ring renewals—high fuel or oil bills—as matters of course, when COOK'S Rings have so definitely proved that they can end these wasteful conditions. Find out exctly what these outstanding rings can do for you. WRITE—today—giving performance characteristics of your engine.

C. LEE COOK MANUFACTURING CO.

INCORPORATED

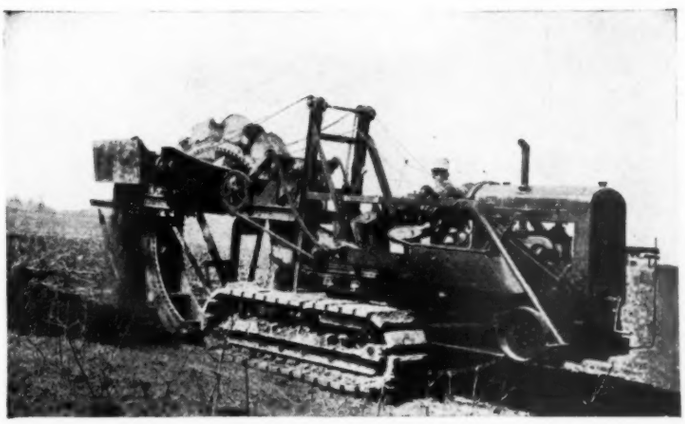
New York Cleveland Baltimore Los Angeles LOUISVILLE, KY. Chicago Tulsa San Francisco New Orleans

START SAVING NOW···

with CLEVELANDS "MODEL 110"

Dig Anywhere Anytime

Records on hundreds of miles of work show substantial savings with the Cleveland "Model 110." Because they are built to meet requirements, to do more work in more places in the shortest possible time, Clevelands have achieved deserved popularity.



Drop us a line and let us furnish you with the facts either personally or by mail.

THE CLEVELAND TRENCHER CO.

20100 ST. CLAIR AVE. **CLEVELAND, OHIO**

Another reason for "Cleveland's" pre-eminence. High-speed, low-cost transportation via special trailer. Loads or unloads in 10 to 15 minutes.

CLEVELANDS

SPEED UP REPAIRS

with FAST Oakite Cleaning

CLEANING before repairing is always sound practice. For clean parts are easier to inspect; easier to handle, easier to assemble. Repair work on oil field or refinery equipment goes smoothly; equipment is back into service in record time.

And when an Oakite material does the cleaning... even MORE TIME is saved. Oakite materials bring NEW speed to the cleaning tank... and more cleaning power, too. Surfaces are made absolutely clean. What's more... Oakite cleaning is economical. It effects surprising savings.

A Useful Guide for You

Our free cleaning chart contains many sound ideas on cleaning that will prove of real help. Write for it... there's no obligation.

Manufactured only by
OAKITE PRODUCTS, INC., 48 Thames Street, New York, N. Y.
Branch Offices and Representatives in All Principal Cities of the U. S.

OAKITE

TRADE MARK REG U.S. PAT OFF.

SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

BALDWIN SUPER SERVICE AND *Full Flex* OIL FIELD CHAIN

ask the Driller.. He Knows

Factory Representative
GEO. J. FIX, Dallas, Texas
For Sale in All Oil Fields

Miller Sand Pumps
are inexpensive

Sediment in the Bottom of Your Well
is expensive

Sand and mud in your well is holding back the flow of oil and keeping down production. Clean out this sediment quickly and at small cost with a MILLER —*the Sand Pump with the powerful suction action that is in world-wide use.*

The MILLER is made in diameters of 2½, 3, 3½, 4, 4¼, 5, 5½, 7 and 9 inches and lengths of 20, 25 and 30 feet. 5/32 inch wall thickness seamless tubes used in REGULAR Type Sand Pump. One quarter inch wall tubes used in HEAVY type Sand Pumps.

SAND BOTTOM

Used when tools are run and when well is shot to quickly remove loose material.

BAILER BOTTOM

With the Bailer Bottom installed the Miller is changed to a Bailer giving you a combination of either a Bailer or Sand Pump in one tool.

MILLER SAND PUMPS ARE SOLD BY SUPPLY COMPANIES EVERYWHERE

Write for Descriptive Folder and Price List

CHISEL BOTTOM
(In Pump)

Will often save the expense of running tools as its chisel shape breaks up tightly packed sands.

MILLER SAND PUMP CO.

General Offices and Shop,
Box 4516
OKLAHOMA CITY, OKLA.

Branch Shops and Offices:
Sapulpa, Oklahoma, and Kilgore, Texas

PATENTED
No. 1370340
No. 1523604
No. 1787390
No. 1862628
No. 1866828
No. 2055667

George C. Knipfel Transferred

George C. Knipfel has been transferred from the Mid-Continent office of the Waukesha Motor Company, Tulsa, Oklahoma, to cover the Kansas territory as sales representative, and while he will work out of the Mid-Continent office, his headquarters will be in Wichita, Kansas.

GEORGE C. KNIPFEL

Knipfel has been with the Waukesha Motor Company 12 years, ten of which were spent at the home office in Waukesha, Wisconsin, and two with the branch at Tulsa.

E. M. Smith on European Trip

E. M. Smith, president and general manager of the Emsco Derrick and Equipment Company, and head of various other manufacturing organizations affiliated with the petroleum industry, left early this month on the first leg of an extensive tour and survey of Europe and the Near East.

Smith will be met at Frankfort by D. A. Sutherland, general manager, and R. M. Dinges, sales manager, of

E. M. SMITH

Emsco Engineering Company, Ltd., of St. Albans, Herts, England, who will accompany him on the tour. They will inspect a number of the largest plants in Europe engaged in the manufacture

We've changed our NAME

To Better Apply to the Expansion Under Which Our Organization Has Gone to Meet the Oil Industry's Demand for Our Products and Service.

AUTHORIZED APPLEMAN BIT SERVICE COMPANY, organized in 1930 to distribute and service a single type of drilling bit, has grown in six years to the position of leadership in its class of service in the Gulf Coast with a complete line of bits and the Hunt Wire Line Core Barrel, plus a complete repair service on all classes of drilling equipment.

HUNT TOOL COMPANY, successor to the original firm, employs 110 men, operates 38 trucks and cars, and has field branches at the following points: Joinerville, Talco, Corpus Christi, Bay City and Alvin, Texas; and Rodessa, Jennings and Houma, Louisiana.

of oil field equipment of various types. Later they will visit many of the important foreign oil fields. Before returning to England on the homeward journey, "E. M." will visit The Hague in Holland, and doubtless will attend the World Petroleum Conference in Paris in June.

R. H. Colley New President Atlantic Refining Co.

J. W. Van Dyke, chairman of the board of The Atlantic Refining Company, has announced the election of Robert H. Colley, former vice-president and treasurer, as president of the company. Colley succeeds W. M. Irish who retired as president, effective May 3. E. H. Blum, vice-president in charge of domestic crude oil producing, was elected to the board of directors to fill the vacancy created by the retirement of Mr. Irish.

ROBERT H. COLLEY

Paul Shuman, a former assistant treasurer, was elected treasurer, R. C. Tuttle in charge of transportation, and A. A. Garrabrant, assistant manager of foreign sales, were elected vice-presidents.

The new president of The Atlantic Refining Company first entered the service of the company in 1919. During the World War he served as an officer with the United States Field Artillery. He was elected assistant treasurer of the company in 1926. His election as treasurer and director took place in 1929. His residence is at Wayne, Pennsylvania.

J. T. McFarland Named Sales Manager Lycoming Gas Engine Division

E. D. Herrick, president of the Lycoming Manufacturing Company, Williamsport, Pennsylvania, has announced the appointment of J. T. McFarland to the position of sales manager of the Natural Gas Engine Division of the company.

J. T. McFARLAND

McFarland is widely known in the Diesel and gas engine fields and for the last 18 years has been associated with the Worthington Pump and Machinery Corporation in various capacities. He spent five years as an engineer for this company in the oil fields giving special attention to oil pipe lines and in turn was manager in charge of sales for this company in the El Paso and St. Louis districts. From 1934 until his connection with Lycoming he was western manager of the oil and gas power division of the company with headquarters in Chicago.

In his new connection McFarland will be in charge of sales for Lycoming's gas-engine generating units and gas engines for general power purposes, with headquarters at Williamsport. These units and engines were introduced recently and have created a tremendous interest in all parts of the country.

H. C. Price Company Formed

The H. C. Price Company, a co-partnership, was formed May 1, and the electric welding business of H. C. Price, Inc., has been transferred to the new company, which is under the same ownership and management as heretofore. General offices are at Bartlesville, Oklahoma.

Complete Stocks

Complete and diversified stocks including many nationally known lines famous for oil country performance, adequately equip United Supply to meet the needs of operators.

Convenient Stores

Seven United Stores, strategically located in four states, insure easy access, convenient store service and prompt delivery in all adjacent active fields.

Intelligent Service

United management and personnel, widely experienced in the supply business, offer a sales and engineering service which give a plus value to United merchandise and delivery.

STORES:

Chase, Kansas
Hutchinson, Kansas
Oklahoma City, Oklahoma
Stonewall, Oklahoma
Eunice, New Mexico
Houston, Texas
Odessa, Texas

UNITED SUPPLY & MANUFACTURING COMPANY

TULSA, OKLAHOMA DALLAS, TEXAS

H. B. GUTELIUS C. J. HALLORAN F. P. THIEMAN

E. L. Decker on Trip to South America

E. L. Decker, of the Martin-Decker Corporation, Long Beach, California, left recently by Pan-American Airways for a six weeks' sales trip to South America. He plans visiting the principal oil-producing countries there in the interests of Martin-Decker scientific drilling and production control instruments and is taking with him one of the company's new Clipper model weight indicators, which he says makes an ideal traveling companion because it is so light and compact.

His itinerary is attractive enough to make anyone get itchy feet this time of the year. Leaving from the Grand Central Terminal at Glendale he spent the first night in Mexico City, then Guatemala City and a few days in Panama watching the big boats paddle through the canal. From there he planned to fly down the east coast to Barranquilla, Colombia; thence by German Scadta plane into the interior to Barranca Barmeja, and back to the coast again. By Pan-American Airways he planned to travel eastward along the coast into Venezuela, visiting the fields around Maracaibo and Caripito, then cross over to Trinidad for a few days. From that point he plans flying back

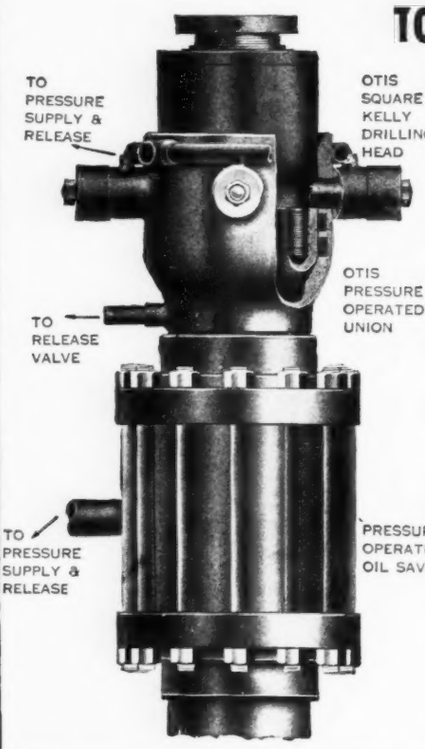
E. L. Decker introduces a new kind of clipper to Airman Thayer

to Miami to inspect the bathing and fishing there and will stop at Houston on the return trip to check on Gulf Coast activity.

NOT A *Warning* BUT A *Reminder*

TO OPERATORS IN THE FOLLOWING FIELDS

- CORPUS CHRISTI
- RODESSA
- WEST TEXAS
- HOBBS
- OKLAHOMA


TO PRESSURE SUPPLY & RELEASE
OTIS SQUARE KELLY DRILLING HEAD
OTIS PRESSURE OPERATED UNION
TO RELEASE VALVE
TO PRESSURE SUPPLY & RELEASE
PRESSURE OPERATED OIL SAVER

The Otis Square Kelly Drilling Head along with the Otis Pressure Operated Union gives you not one but two very profitable applications. This assembly not only serves for drilling in under pressure control but for use as a Square Kelly Blow-out Preventer. Advantages of drilling in under pressure control are many. Reduced drilling time; no mud intrusion of the producing horizons; more accurate knowledge of formations being drilled and far greater safety are only a few. This modern, thoroughly proven, assembly therefore fills the bill for you whether you are combatting extremely high pressures, or (perhaps in the same field) your pressure has declined to a point where it is not advisable to use a heavy mud column and endanger your pay sand. In numerous cases this Otis assembly is coping with one or both of the above applications equally well in the same field.

OTIS — PRESSURE CONTROL SERVICE — EQUIPMENT

Headquarters: Tower Petroleum Bldg., Dallas, Texas
Branches: Houston, Shreveport, Oklahoma City, Ada, Hobbs

New Manager Alexander Anderson, Inc.

Announcement has been made, of the appointment of Norman L. Dorn, as general manager of Alexander Anderson, Inc., division of Lane-Wells Co., with headquarters at Fullerton, California.

Dorn, for the last 17 years, has been connected with the drilling and production units of the Shell Oil Com-

pany and for the last two years has been superintendent of the production department in their Long Beach Division.

Kobe, Inc., Expands Service

Expanding its service to Mid-Continent and Gulf Coast operators, Kobe, Incorporated, manufacturers of the Kobe hydraulic pump and Kobe heat-treated screen casing, recently established a company branch at Oklahoma City, Oklahoma, and appointed a representative for Kobe pipe at Houston, Texas.

The newly appointed Kobe representative at Houston is Brown-Hovis, Inc., operator of an oil well supply sales and service business, having headquarters at 2214 Campbell Street. Complete stocks, sales, and service facilities for Kobe heat-treated screen casing will be maintained by this company.

C. M. RADER

Since the organization of Brown-Hovis, Inc., in October, 1935, the firm has been very active and is well known among operators in the Gulf Coast area. W. S. Hovis, vice-president and general sales manager, has been in the oil well supply business since 1919 and was sales manager of the Halliburton Oil Well Cementing Company from 1929 until the formation of Brown-Hovis, Inc.

The new Kobe branch at Oklahoma City is at 3119 South Robinson Avenue, where complete stocks of Kobe pumps and parts, and Kobe heat-treated screen casing will be maintained, together with adequate sales and field service facilities for efficiently serving Mid-Continent operators.

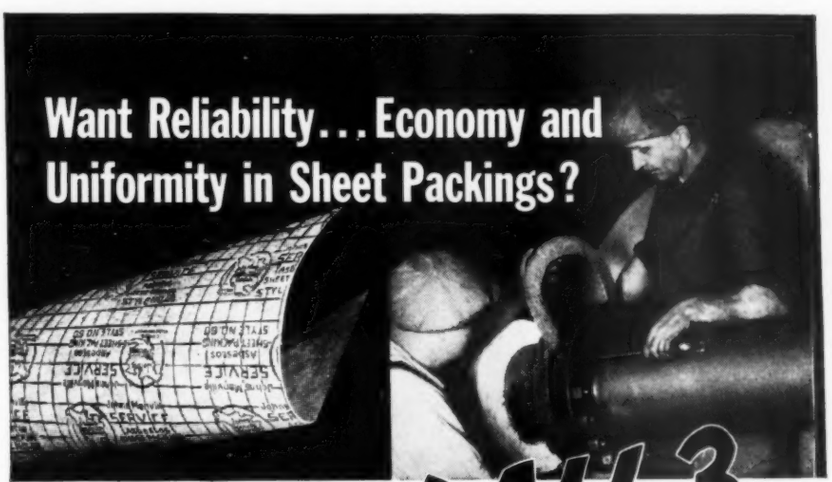
C. M. Rader, division manager, in charge of the Oklahoma City branch, is a graduate civil engineer (University of Minnesota) who started his career in Wyoming oil fields. He has had many years engineering experience, mostly in the oil industry, and is widely known among oil men of the Mid-Continent area.

STRAIGHT TALK.... about CROOKED HOLES

Write for literature

SPERRY-SUN WELL SURVEYING CO.

1608 Walnut Street, Philadelphia, Pa.
425 Petroleum Building, Tulsa, Okla.
3118 Blodgett Avenue, Houston, Texas
549 East Bixby Road (3800 Block—Atlantic Ave.) Long Beach, Calif.
Bank of Lafayette Bldg., Lafayette, La.
c/o Elks Club, 17th and I Streets, Bakersfield, Calif.



You get ALL 3 in J-M SERVICE SHEET (Style No. 60)

SHEET PACKING worthy of its name must offer dependability and economy in use on a wide variety of service conditions. And there must be no variation in quality from one shipment to the next.

To this rigid standard J-M Service Sheet (Style No. 60) is designed and manufactured. Over sixty years of experience go into its making . . . into its carefully guarded uniformity.

Made of selected long-fiber asbestos and special heat-resisting compounds, J-M Service Sheet has a record for outstanding performance on flanges and other parallel surfaces against superheated or saturated steam . . . against gas, oil, air, water, ammonia, certain acids and alkalies.

• • •

Have you a copy of our latest packings catalog on hand for quick reference? It describes the complete line of J-M Materials—designed to meet every specific packing need in your plant. Simply write Johns-Manville, 22 East 40th Street, New York City.

Johns-Manville PACKINGS AND GASKETS

Conference on Refinery Measurement and Control at Houston Show

CERTAIN phases of the Oil-World Exposition program, to be held in Houston, Texas, October 11-16, will be of primary interest to supervisory personnel, engineers, chemists, and operators from refineries and natural gasoline plants. A subject of vital interest to these men is the matter of measurement and control. Therefore, the oil exposition in conjunction with the Refinery Committee and a number of the leading refinery men have decided to provide a "Conference on Refinery Measurement and Control."

A two-day program consisting of four sessions will be held October 13 and 14 in the Convention Hall of the Exposition Building, sponsored by Rice Institute, University of Texas, and A. & M. College. Three professors from each of the three universities have been appointed to act as chairmen and supervise this entire program. A tentative program has been adopted by the Refinery Committee as follows:

Wednesday, October 13, morning—Measurement and Control; Refinery Processes; Natural Gasoline Plant Processes.

Wednesday, October 13, evening—Measurement of Flow; Measurement of Temperature, (a) Thermometry, (b) Pyrometry.

Thursday, October 14, morning—Selection of Values for Automatic Control; Pressure Regulation.

Thursday, October 14, evening—Liquid Level Regulation; Temperature Control; Flow Control.

The professors from each of the three universities are as follows:

Rice Institute: Dr. A. J. Hartsook, head of Department of Chemical Engineering; J. S. Waters, professor, Electrical Engineering Department; J. H. Pound, professor, Mechanical Engineering Department.

University of Texas: H. E. Degler, professor, Mechanical Engineering Department; M. N. Heller, professor, Mechanical Engineering Department; Byron E. Short, professor, Mechanical Engineering Department; H. H. Power, professor, Petroleum Production Engineering Department, will cooperate with the three professors of the University of Texas in the program.

Agricultural & Mechanical College: Dr. C. C. Hedges, head of Department of Chemistry and Chemical Engineering; F. F. Bishop, professor of petroleum technology, Chemistry and Chemical Engineering Department; C. W. Crawford, professor, Mechanical Engineering Department.

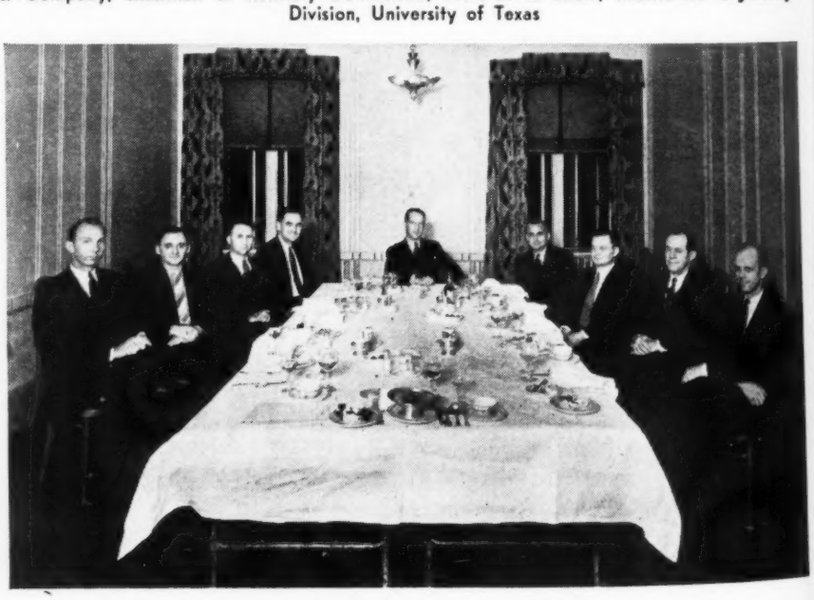
It is planned to begin the conference with two papers designed to bring out, by reference to flow charts, the basic applications to these various processes requiring measurement of flow and temperature, and control of liquid level, temperature, and rate of flow. It is proposed to have the first two papers, which will be of a general nature, delivered by men of recognized standing either in the refinery or natural gasoline divisions; or from consulting or construction companies qualified to cover this field authoritatively. Succeeding papers will be delivered by well known engineers, specialists in their particular field of design and manufacture.

It has been decided to invite all the universities to bring their engineering classes to this conference, particularly those from the mechanical, petroleum engineering, and chemical engineering departments. Universities and colleges from all states are invited to participate in this conference. The three professors from each of the three Texas universities will allocate among themselves the several divisions of the conference and will have complete charge during that period allotted to them. The sponsor of the program will initiate each meeting with appropriate introductory remarks; and following the presentation of the paper, will lead the discussion and criticism.

The Refinery Committee is planning to invite all colleges and universities to bring their junior and senior engineers to this conference and to encourage them to enter into the discussions. While the exposition will be open to the general petroleum public, this conference will be open by invitation only to those groups having a definite interest in this phase of petroleum engineering.

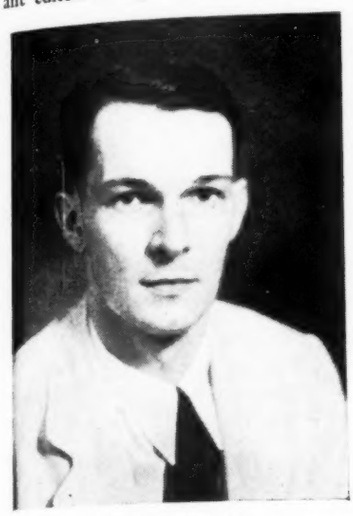
The conference on refinery measurement and control is under the direct supervision of M. N. Dannenbaum of the M. N. Dannenbaum Company, as chairman; and a committee composed of Joe Miller, assistant superintendent of natural gas plants, Humble Oil and Refining Company; and R. L. Mallory, sales engineer, Brown Instrument Company. They are working with the general refinery committee composed of W. H. Curtin, chairman; and a committee composed of George Reid, Editor of *"The Refiner;"* O. E. Berg, sales engineer, Babcock and Wilcox Tube Company, and W. J. Peddie, vice-president, Maintenance Engineering Corporation.

Refinery Measurement and Control Committee: Left to right: R. L. Mallory, sales engineer, Brown Instrument Company; Prof. M. M. Heller, Mechanical Engineering Division, University of Texas; Prof. Wm. A. Cunningham, Chemical Engineering Division, University of Texas; George A. Reid, Editor, Refiner Magazine; M. N. Dannenbaum, M. N. Dannebaum Company, chairman; Ed Lenzner, general manager, Oil-World Exposition, Inc.; Prof. H. E. Degler, Mechanical Engineering Division, University of Texas; W. H. Curtin, president, W. H. Curtin & Company, chairman of Refinery Committee; Prof. B. E. Short, Mechanical Engineering Division, University of Texas



Ralph H. King Joins Staff of The Petroleum Engineer

Ralph H. King has joined the staff of *The Petroleum Engineer* as assistant editor. King recently has been



RALPH H. KING

practicing as an independent consulting petroleum engineer at Wichita Falls, Texas, specializing in secondary recovery methods of oil production. Previously he had been connected with the petroleum industry in various capacities since 1933, at which time he received his M.S. degree in petroleum engineering from the University of Texas. Subsequently he was employed in a technical capacity with the American Liberty Oil Company at Dallas, was engaged as assistant to various consulting geologists and a petroleum engineer, was a research worker in paleontology under the Penrose Fund of the Geological Society of America, and was an instructor in petroleum engineering at Pennsylvania State College.

King is a member of the American Institute of Mining and Metallurgical Engineers, and the Society of Economic Paleontologists and Mineralogists.

Correction

On page 48, April issue of *The Petroleum Engineer* appeared an illustration captioned "Fig. 4. Old type Cooper-Bessemer Diesel now obsolete." This caption is in error. The illustration shows a cross-section of one of Cooper-Bessemer's late type engines. Reference made in the text to this illustration also was incorrect.

"Slats" Love on Trip

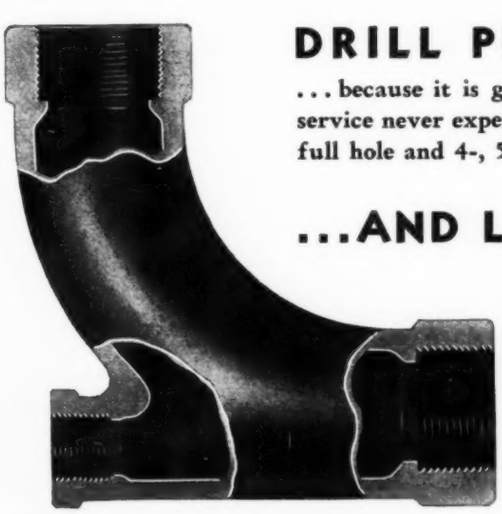
"Slats" Love, sales manager of Chiksan Oil Tool Company, left California recently for a two months' auto trip through the Mid-Continent and Gulf

"SLATS" LOVE

Coast territories. Visiting Texas, Oklahoma, and Kansas he will check up on the latest field developments in those areas, particularly as regards pressure drilling where Chiksan all-steel rotary hoses are being used.

Refineries and dock loading stations also are to be inspected as considerable business in Chiksan swing joints and dock risers is coming from these installations.

Ask for BRAUER



DRILL PIPE FLOAT

... because it is giving operators a superior type of service never experienced before. Made in 3-in. A.P.I. full hole and 4-, 5-, and 6-in. regular full hole sizes.

...AND LONG SWEEP ELL

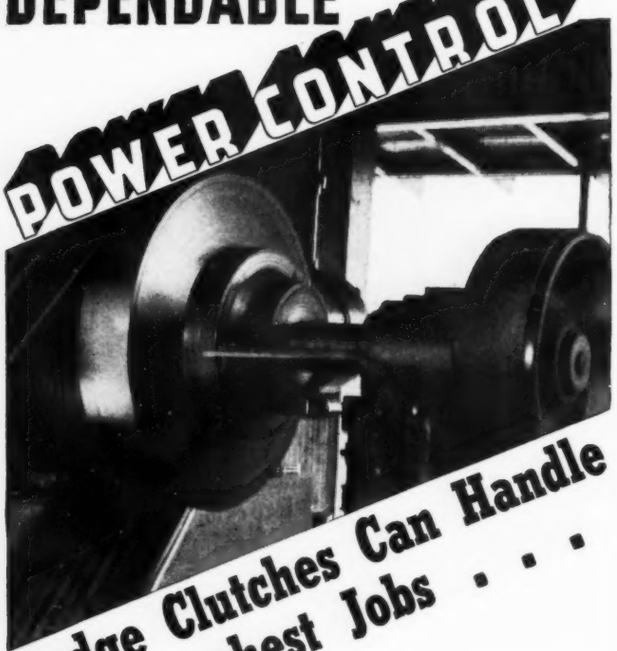
... because it reduces frictional losses and will stand up where ordinary connections will cut out. The 2-in. side outlet is convenient for extra connections such as release lines, mud mixing, etc.

BRAUER MACHINE & SUPPLY CO.

OKLAHOMA CITY, OKLAHOMA

Hobbs, New Mexico—Phone 140 Fittstown, Oklahoma Great Bend, Kansas

DEPENDABLE POWER CONTROL



Dodge Clutches Can Handle the Toughest Jobs . . .

Dodge Diamond "D" Friction Clutches are efficiently, dependably, and economically adapted to power transmission as well as for application to various types of machinery used in the oil fields. They are ruggedly constructed and capable of handling 100% overload, insuring safety and protection and positive power control under any conditions of service.

Specify Dodge Diamond "D" Clutches for steady, uninterrupted service. Send for copy of Catalog No. A-200.

DODGE MANUFACTURING CORPORATION
MISHAWAKA, INDIANA, U. S. A.

See the Dodge 20-page section in the Oil Field Composite Catalog

THE Right DRIVE FOR EVERY JOB

DODGE
MISHAWAKA
THERE IS ADDED VALUE IN THE NAME DODGE

TRADE LITERATURE

PORTABLE RIG COMPANY, INC., Houston, Texas, has issued Catalog No. 37 descriptive of its modern drilling equipment. The booklet is profusely illustrated with photographs and drawings, and complete specifications and descriptions are given of each item of equipment. Copies will be sent free upon request to the manufacturer.

●

IXL HELICAL OIL WELL pumping reducers, manufactured by Foote Bros. Gear and Machine Corporation, Chicago, Illinois, are fully described in Bulletin No. 402 just issued. Their application is discussed in detail in this well-illustrated publication, which also contains much other data of interest to those connected with the petroleum industry.

●

SEISMOGRAPH SERVICE CORPORATION has published a most interesting booklet in which are given pertinent facts relative to reflection seismic surveys. To those interested in exploration work this publication contains information of considerable value. The booklet will be sent free to anyone requesting it from the Seismograph Service Corporation, Kennedy Building, Tulsa, Oklahoma.

●

OAKITE PRODUCTS, INC., through its research division, has developed a new material known as Oakite Airefiner that, it is claimed, when added to the re-circulating water used to wash or scrub air in an air-conditioning system, keeps the wash-water sterile and prevents slime and algae deposits in the system. This new material is said to be completely soluble, transmits no odor to water or air, and provides a stable, colorless solution that is safe and non-toxic. An interesting booklet giving further details in connection with this new development is available on request to those interested. The booklet is free. Address correspondence to Oakite Products, Inc., 22 Thames Street, New York, N. Y.

●

"HAYNES STELLITE J-METAL CUTTING TOOLS," a new 52-page booklet of interest to every user of machine tools, has just been published by Haynes Stellite Company, a unit of Union Carbide and Carbon Corporation. This booklet, with more than 60 illustrations of tools and machining operations, contains complete, detailed information on how to obtain maximum results in machining cast iron, malleable iron, and most steels.

●

THE BROWN INSTRUMENT COMPANY, Philadelphia, has published a new catalog on Brown CO_2 meters. This new catalog (No. 3005) covers the complete line of Brown indicating and recording CO_2 meters, as well as the combined CO_2 and flue gas temperature recorders.

●

MAPPING GEOLOGIC STRUCTURE With the Magnetometric Methods is the title of a booklet issued by William M. Barrett, Inc., consulting geophysicists, Shreveport, Louisiana. In the publication the history of the development of magnetometric methods is given, as well as the principles of operation, together with specific examples of their use in surveying certain areas.

●

EC & M STEEL-CLAD MOTOR CONTROL is the title of Booklet No. 67 of The Electric Controller and Manufacturing Company, Cleveland, Ohio. Its pages are devoted to the description of a few recent installations of these control units.

THE LINCOLN ELECTRIC COMPANY, Cleveland, Ohio, has issued two bulletins. One discusses the Lincoln Welding School, which boasts of thousands of graduates who are holding responsible positions due to their practical training. The other bulletin, No. 321, describes the Lincoln Type T electrode holder. This holder, the manufacturers state, contributes materially to the speed and quality of welding. Either or both bulletins can be obtained by writing the Lincoln Electric Company.

●

BULLETIN No. 56 of the Baldwin-Duckworth Chain Corporation, Springfield, Massachusetts, discusses SS-3 and SS-4, Full Flex oil field chains of the offset side-bar type. These chains embody precision and heat-treating qualities of the well-known Baldwin Super Service Chains, but are of lighter construction and entirely adequate for the usual drilling conditions and ordinary oilfield needs, it is stated.

●

C. J. TAGLIABUE MANUFACTURING COMPANY, Park and Nostrand Avenues, Brooklyn, New York, has issued a new pyrometer catalog, 1101C, containing a number of new developments, particularly a new high-speed photoelectrically-balanced multi-point recorder, listed for the first time on pages 2, 3, and 4 in this book. The announcement of this new instrument should be of interest to many. A free copy of the catalog may be obtained by writing the manufacturer.

●

MARTIN-DECKER CORPORATION has published a leaflet describing and illustrating typical uses of the measuring line weight indicator. The device is another of their scientific control instruments and shows the actual tension in measuring lines even while they are in rapid motion. It is invaluable to those who run instruments in wells for bottom-hole pressure tests, directional surveys, locating plugs during cementing, etc., the manufacturers say, as it gives a continuous reading on the line strain and prevents losing valuable tools in the hole.

The leaflet is for free distribution and will be sent to any one requesting it from the Martin-Decker Corporation, Post Office Box 571, Long Beach, California.

●

GEOANALYZER CORPORATION recently brought out a new 16-page booklet on electrical logging of wells that explains the principles and methods of operation of the geoanalyzer equipment and gives a detailed description on the interpretation of the curves. The most novel portion of the book, however, is that devoted to the geological structures and the relative electrical curves for every important field in the state of California. Page-length diagrams show the geological logs of the fields and placed alongside these logs are typical geoanalyzer curves showing just how the curves are affected by the different formations. This booklet is being distributed by the Geoanalyzer Corporation, 2555 American Avenue, Long Beach, California.

●

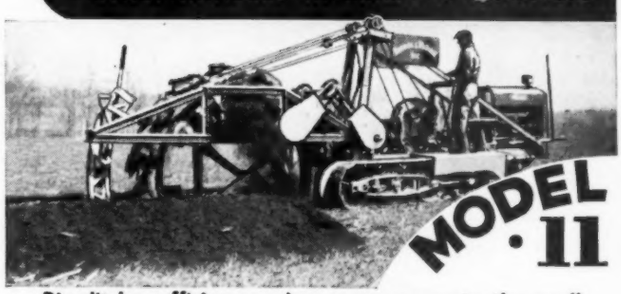
THE AMERICAN METER COMPANY, INC., has issued a folder describing its new development, American Soldered Seal Index Frame and Glass for use on American Tinned Steelcase Meters. The glass is resistant to extreme heat and it, together with the frame, form a gas-tight seal. Further information can be obtained from the manufacturer at Erie, Pennsylvania.

●

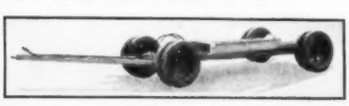
MANY MAJOR IMPROVEMENTS have been made in the complete line of portable and switchboard Type CD strip-chart recording instruments for alternating and direct current, manufactured by General Electric Company, Schenectady, New York. A bulletin has been published that illustrates some of the more important improvements and describes briefly the advantages to users.

A Buckeye DITCHER
for TRENCH 10" to 22" WIDE

• OVERALL WIDTH OF MACHINE ONLY 52"
• EASILY HANDLED IN CRAMPED QUARTERS



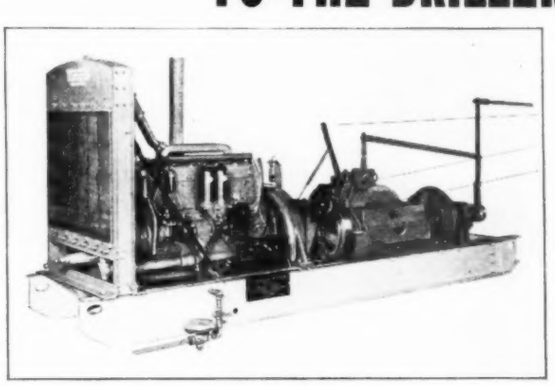
Big ditcher efficiency and economy comes to the small ditching field in the Buckeye Model 11. Built for steady, time saving operation, with speed for easy going and rugged strength for the toughest jobs – features of Buckeye engineering that always save you money on any job. Before you buy a ditcher, be sure you have the facts about Model 11.



This specially designed Buckeye trailer is for quick and easy transportation of the Model 11. The ditcher climbs onto the trailer under its own power, fully assembled.

THE BUCKEYE TRACTION DITCHER CO., FINDLAY, OHIO

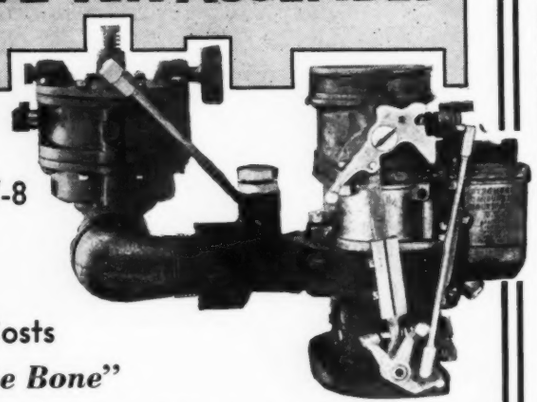
MORE POWER
TO THE DRILLER



• Young Engines actually deliver *more power* for each unit of fuel used because of the unusually high efficiency of the transmission. Equipped with Timken bearings and accurately cut alloy steel gears, the unit is so friction-free that it can be rotated easily with two fingers on the clutch. Savings in cost of fuel, water, lubrication, setting up and dismantling make drilling with Young Engines most economical. Write for New Bulletin 20-P. Young Engine Corporation, Canton, O., or see A. E. Avers, 230 E. 14th St., Tulsa, Okla.

YOUNG DRILLING ENGINES
GAS . . . GASOLINE . . . DIESEL

FORD V-8 *Natural Gas* ADAPTER ASSEMBLY



Cuts
Ford V-8
Power
Unit
Fuel Costs
"To the Bone"

Where natural gas is available, the fuel costs for Ford V-8 Power Units can be cut to absolute minimum by installing this assembly. It permits operating alternately on gas and gasoline, changing from one fuel to the other according to convenience and economy. Worthwhile savings and smooth, dependable power delivery have been proved by many oil field installations. For complete details write for Bulletin 190-A.

Butane Equipment; Gasoline Carburetors for Industrial Engines and Tractors

ENSIGN CARBURETOR COMPANY, LTD.
HUNTINGTON PARK, CALIFORNIA

Chicago Branch: 2644 South Michigan Avenue. *Distributors with Stocks:* A. W. Schuller, Inc., Tulsa, Okla.; The Binkley Co., Oklahoma City, Okla.; Portable Rig Co., Houston, Texas; H. G. Makelim, Oakland, California; T-V Supply Company, Wichita, Kansas.

No. 17 Beaver 1/8 to 2-Inch

Sold in units! Buy any range! The large holes for oiling and chip clearance are bridged across the top forming an arch between the dies—which prevents spreading of die slots. Die segments are square in shape—no weak "offset" section to develop water cracks in heat treating. Special long-throat die grinding for easy starting and easy pulling.

BEAVER PIPE TOOLS

537 PETROL AVENUE — WARREN, OHIO

Trade Personals

F. F. MURRAY, vice-president of the Oil Well Supply Company, Dallas, Texas, and Mrs. Murray, are the parents of a baby girl born April 30. The newcomer has been christened Marcia Louise.

●

SAMUEL B. ROBERTSON has been elected president of The B. F. Goodrich Company, Akron, Ohio, succeeding James D. Tew who retired May 3 after 31 years' service with the company. Robertson has been executive vice-president and a director of the organization.

●

WILLIAM SIVYER, graduate of the University of Illinois, and B. B. Ross, graduate of Kentucky Wesleyan College, have been appointed to the sales staff of the Philadelphia office of the Lincoln Electric Company. The office is under the management of George R. Johnson.

●

E. M. LANE, field superintendent for Rieber Laboratories, Los Angeles, California, is in charge of the new branch office recently opened by the company at Houston, Texas.

●

PAUL CAVINS, manager of The Cavins Company, Long Beach, California, and John Mulcahy, Cavins' agent for the San Joaquin Valley fields, are now on an extended business tour through Texas and Oklahoma. Spending 30 days on the trip, Messrs. Cavins and Mulcahy are studying operations in Gulf Coast and Mid-Continent fields, inspecting Cavins branches, and making numerous field trips with the company's representatives in the interest of improving Cavins service. They will visit Cavins branches at Houston, Kilgore, Pampa, and Odessa, Texas; and Oklahoma City, Oklahoma, at which points sales and rental service on the Cavins automatic hydraulic suction bailer and fishing tool are maintained.

●

W. F. ANDERSON, St. Louis, Missouri; M. C. Bellamy, Seattle, Washington; G. W. Curtis, Milwaukee, Wisconsin; H. V. Fleming, Birmingham, Alabama; B. E. Keifer, Cincinnati, Ohio; H. D. Robb, Pittsburgh, Pennsylvania, and B. M. Tinlin, Huntington, West Virginia, have been appointed district managers in charge of steel sales for the Steel and Tube Division of The Timken Roller Bearing Company.

●

ARTHUR S. ELSENBAST, manager of the filter aids and filler department of Johns-Manville, has been appointed vice-president of the Johns-Manville Sales Corporation, according to an announcement made by Lewis H. Brown, president of the parent company. As vice-president, he will continue in charge of this department, which he has headed for the last four years, Mr. Brown said.

●

JOHN W. WHITE has been elected vice-president and general manager of the Westinghouse Electric International Company. He will make his headquarters in New York City.

Homer J. Forsythe Dies

On April 29th, Homer J. Forsythe, general manager of the Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey, died following an emergency operation while on a visit to Pinehurst, North Carolina. Forsythe was in his 53rd year. He was born in Wilmington, Delaware, November 15th, 1883. His home was in Montclair, New Jersey.

From an executive position with the E. I. duPont de Nemours Company in Wilmington, he came to Hyatt in 1921 as assistant general manager, and in 1922 was appointed general manager.

Golf Tournament Delayed by Full Institute Program

So full a program has been prepared for the American Petroleum Institute's seventh mid-year meeting at Colorado Springs, Colorado, June 1 to 3 next, that it has been found necessary to hold the annual golf tournament on Friday, June 4, the day after the meeting ends.

A special prize, known as "The J. Edgar Pew Trophy" will be awarded to the winner. Several flights, according to handicap, and with several prizes for each flight, also have been planned. John R. Suman, of Humble Oil and Refining Company, Houston, Texas, chairman of the tournament committee, is receiving entries, with home-club handicaps indicated.

Mid-Continent Supply Opens New Store

The Mid-Continent Supply Company, with general offices in the Mid-Continent Building, Fort Worth, Texas, has opened a new store at Lisbon, Louisiana, with G. C. Colwell as store manager.

Should Have Been 4000 Feet

On page 51, April issue *The Petroleum Engineer*, in the last paragraph on that page appeared the following sentence: "A crew of three or four men working behind a ditcher can lay 400 ft. of 3-in., 4-in., or 6-in. pipe in an 8-hour day." The 400 ft. is a typographical error and should have read 4000 feet.

International Supply Open Dallas Office

International Supply Company has opened an office at Dallas, Texas. The office is at 1121 Liberty National Bank Building, under the direction of Hayes O. Trego, district manager. R. L. Neal is district manager of the recently-opened Wichita, Kansas, office, 507 Bitting Building.

McNeely Materials Company Named Representative

Vernon Tool Company, Ltd., Los Angeles, announces the appointment of the McNeely Materials Company, 2935 Jensen Drive, Houston, Texas, as Gulf Coast and Mid-Continent representatives for the Vernon-McNeely vibrating rotary mud screen. The McNeely Materials Company is operating under the management of J. W. McNeely and the sales force includes R. J. Carlson, J. A. Durham, and L. M. Prince. The company handles a complete line of screens, motors, and turbines, and is equipped to render a general service.

Lycoming Manufacturing Company Opens Texas Branch

The Lycoming Manufacturing Campany, Williamsport, Pennsylvania, has opened a Texas branch at 3600 Commerce Street, Dallas. George B. Barr is in charge as state representative. The distributor at Tulsa for the Lycoming Manufacturing Company is The Moorlane Company. A distributor for Houston, Texas, is to be announced later.

The new branch at Dallas, as well as the Tulsa and Houston distributors, will carry a full line of natural gas engines and dual automatic electric sets.

Saves
TIME AND LABOR

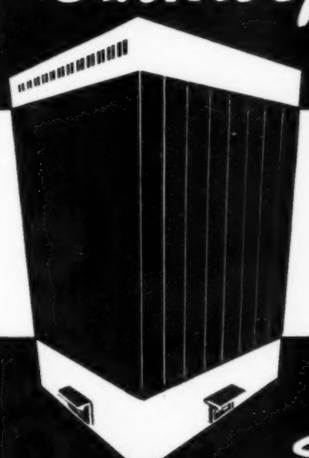
The Huf-Duo Insert Pump *lowers lifting costs,* by greatly reducing time and labor.

This pump is run in on the sucker rods, and seats in an installed working barrel. Without damage to cups, it can easily be unseated to make rod repairs. Through improved design, the Huf-Duo also reduces power consumption and rod stress.

For 2″, 2½″, and 3″ tubing; in stock at oil-field distributors. The Charles N. Hough Mfg. Company, Franklin, Pa., and Tulsa, Oklahoma.

Huf-Duo
INSERT PUMP

That Friendly Atmosphere



Plus
FINE FOOD
Rates: $2.00 Up

STOP AT THE *Hotel*
TULSA

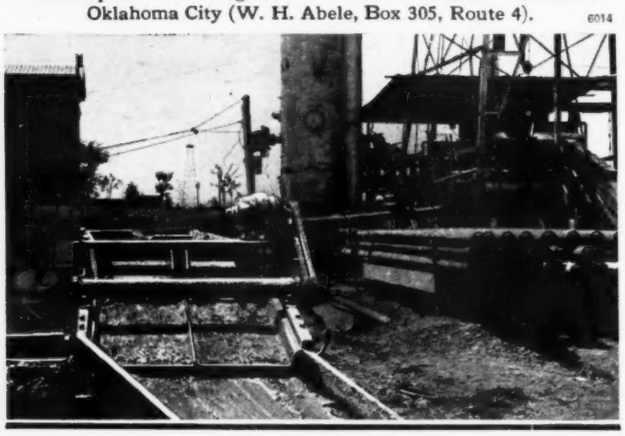
LINK-BELT *Vibrating* SCREENS

for Reconditioning Rotary Mud

● The Link-Belt screen has proved by actual performance that it is the lowest cost method of reconditioning rotary mud. It has many exclusive advantages such as—larger screening area—longer life of screen cloth—ease of transportation—minimum head room required, etc. Send for Folder No. 1672.

LINK-BELT COMPANY

Philadelphia Los Angeles New York Dallas Houston
Oklahoma City (W. H. Abele, Box 305, Route 4). 6014



You Can Cut Anchorage Costs to 29c Per Well!

Pulling tubing with a Franks truck motor driven winch

The average cost of winch anchorage in the Glen Pool is $35.00. A major oil company in this field, using 3 Franks Winches, spent less than $200 providing anchorage on some 700 wells—29 cents each, due to *Franks exclusive anchorage* facility. This represents a saving over the average unit of 700 x $35.00, or $24,500.00.

Franks units mount upon any truck 1½ to 10 tons. Six sizes truck motor driven, four sizes skid type. Wire for information or a demonstration. See Composite Catalog, pages 590-96.

FRANKS MFG. CORP.
WELL SERVICING AND DRILLING UNITS

P. O. Box 137 Whittier Station Tulsa, Oklahoma
Export Office, 149 Broadway, New York

Bruce Barkis Joins Staff of Lane-Wells Co.

Announcement has been made of the appointment of Bruce Barkis as manager of field operations for Lane-Wells Company. Barkis, formerly general field superintendent for Rio Grande Oil Company and more recently assistant production manager of Richfield Oil Company, joins the Lane-Wells staff to provide the industry with advisory service based upon his years of practical and technical experience and to coördinate the Lane-Wells services with the daily changing problems of the industry, according to Walter Wells, president of the Lane-Wells Company. Barkis' appointment is in line with the aggressive expansion program carried out by Lane-Wells Company during the past few months. Plans are made to provide the industry with more scientific services in all departments of drilling and production.

BRUCE BARKIS

Name of Houston Firm Changed

T. N. Hunt announces that Hunt Tool Company, Houston, Texas, is the successor to Authorized Appleman Bit Service Company, manufacturer of the Hunt wire-line core barrel and a complete line of oil well drilling bits. The change in name and amended charter of the corporation followed by the increase in capitalization from $20,000 to $100,000 and a wide expansion program.

T. N. HUNT

The new Houston headquarters of Hunt Tool Company recently has undergone a program of shop and office expansion that approximately doubled the size of the plant. A branch office and shop at Jennings, Louisiana, equipped to do practically every class of oil field repair work, recently was opened to South Louisiana trade in addition to the Houma shop.

U. V. SEALES

T. N. Hunt is president of the Hunt Tool Company, with P. M. Hunt, vice-president, and U. V. Seales, secretary-treasurer. The company has grown in five years from a small bit shop employing less than a dozen men to a personnel of 110 employees. Field branches are operated at Joinerville, Talco, Corpus Christi, Bay City, and Alvin, Texas, and Rodessa, Jennings, and Houma, Louisiana. The company operates more than 35 service trucks and cars in the fields.

Patterson-Ballagh Corporation Opens Houston Office

Patterson-Ballagh Corporation, Ltd., Los Angeles, California, manufacturers of casing and tubing protectors, has opened a Mid-Continent and Gulf Coast office at 1507 Maury Street, Houston, Texas. The office is in charge of J. M. "Skeet" O'Melveny, well known oilfield equipment salesman. Jack Ballagh, general manager, was in Houston for the opening.

O. T. Dawson Passes Away

O. T. Dawson, vice-president of the National Supply Company, who passed away in a Kansas City hospital April 19, was widely known and highly respected by members of the oil fraternity. Born in Lost Creek, West Virginia, 57 years ago, he began work for the National Supply Company in July, 1905, at Sedan, Kansas. He served National there during the early development in Kansas and was then transferred to Tulsa, Oklahoma, at about the time of the opening of the Glen Pool in September, 1907.

O. T. DAWSON

In March, 1909, he was sent to Independence, Kansas, and placed in charge of the company's secondhand department covering Kansas and Oklahoma. Returned to Tulsa in March, 1912, he was put in charge of the company's secondhand department there.

Progressing through various departments he was respectively district manager, general district manager, division manager, and vice-president. His territory during all these years was the states of Kansas and Oklahoma.

In addition to being vitally interested in all phases of the oil industry, and a director of the International Petroleum Exposition, he was active in the civic affairs of Tulsa where he had made his home for many years.

He is survived by his widow, Mrs. Elizabeth Dawson; L. D. Dawson, of the Stanolind Pipe Line Company, Tulsa; and three sisters and another brother whose homes are in Buckhannon, West Virginia.

Hanlon-Waters Open Chicago Office

Hanlon-Waters, Inc., with general offices in the National Bank of Tulsa Building, Tulsa, Oklahoma, manufacturers of equipment for production, pipe lines, gasoline plants, refineries, power, and industrial plants announce the opening of a Chicago office at 915 Old Colony Building. A. J. Foley a graduate mechanical engineer of long experience handling pressure and liquid-level control equipment for refineries, gasoline plants, and other industrial installations will represent Hanlon-Waters, Inc. from the Chicago office in the capacity of sales engineer covering the eastern territory as far as the Atlantic Seaboard.

A. J. FOLEY

Gotkool
WATER CANS & COOLERS

GOTT WATER CAN
Made in 1½, 2, 5, and 10 gallon sizes.

GOTT Water Cans are the practical way to keep drinking water cool for long periods, protected from impurities and always handy to the job. Snug fitting large removable top, strongly built to withstand rough usage. GOTT Water Coolers have extra large covers and a handy non-leaking push button faucet. Your Supply Store has them, get one today! . . . . .

GOTT WATER COOLER

H. P. GOTT MFG. CO.
WINFIELD, KANSAS

KEEP PURE DRINKING WATER ALWAYS HANDY

Look for the *Arm-and-Hammer*
ARMSTRONG BROS.
Heavy Duty PIPE TONGS

Improved designs give these tongs greater strength and handiness. *Jaws* are drop forged from special steel; are heat treated, hardened and tested for wearing qualities. *Chains* are proof-tested to ⅔ catalog strength (3,600 to 40,000 lb.) *Handles*, forged from high carbon steel, have both stiffness and "spring." Drop forged Chrome-Nickel *Shackel*. Hardened *Bolt*. No finer tongs made. All sizes.

Improved
Standard Tongs
Reversible Jaw Tongs
Back-Up Tongs
Break-Out Tongs

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
331 N. Francisco Avenue, CHICAGO, U. S. A.
Eastern Warehouse and Sales: 199 Lafayette St., New York, N.Y.
San Francisco London
Write for Catalog.

IMPORTANT . . Section One of
THE PETROLEUM ENGINEER'S CONTINUOUS HANDBOOK
Will Appear in the JUNE NUMBER of
THE *Petroleum* Engineer
Rates: 1 year, $2.00; 2 years, $3.00
Use this coupon to order a personal subscription
THE PETROLEUM ENGINEER,
P. O. Box 1589, Dallas, Texas. Date_____
Enclosed is $_____ for a_____ year (new) (renewal) subscription.
*Name*_____
*Title or Occupation*_____
*Company*_____
*Street or P. O. Box*_____
*City*_____ *State*_____

NO PLUGGED PERFORATIONS WHEN YOU USE

The CAVINS

3 TOOLS IN ONE

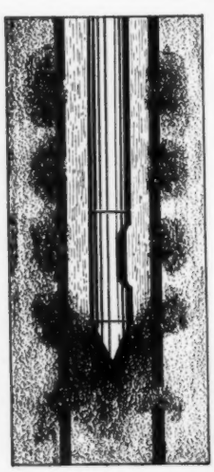


Fig. 1

Ordinary spudding types of bailers (See Fig. 1) actually drive the material back out of the pipe and wedge it tight in the perforations, stopping the drainage.

The Cavins, utilizing the hydrostatic forces present in the well, draws everything into the well; thus flushing the perforations clean and leaving a proper drainage area behind the pipe. (See Fig. 2).

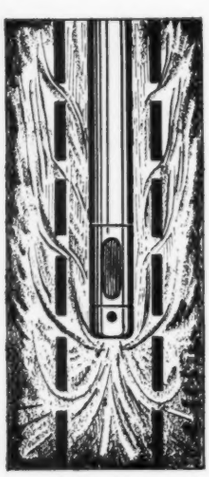


Fig. 2

For detailed information on The Cavins send for Bulletin No. 36

THE CAVINS COMPANY

2853-73 Cherry Avenue Long Beach, California

Phone 414-14 — 414-60

Cable Address: "Cavins, Long Beach"

Foreign Representative: R. J. Eiche

Bakersfield, California — Kilgore, Texas
Taft, California — Pampa, Texas
Ventura, California — Oklahoma City, Okla.
Odessa, Texas — Wichita, Kansas
Houston, Texas — Lyons, Kansas
Lake Charles, Louisiana

INDEX *to* ADVERTISERS

Abercrombie, J. S., Co. 123
American Cable Division of American Chain & Cable Company, Inc. Inside Back Cover
American Iron & Machine Works Co.
American Meter Co. 10
American Roller Bearing Company 15
American Steel & Wire Co.
Armstrong Bros. Tool Co. 153
Axelson Manufacturing Co. 129

Baash-Ross Tool Co.
Baker Oil Tools, Inc. 127
Baldwin-Duckworth Chain Corp. 141
Baroid Sales Co. 75
Beaver Pipe Tools 150
Black, Sivalls & Bryson, Inc.
Bradford Motor Works, Inc. 137
Brauer Machine & Supply Co. 147
Brewster Company, Inc., The 135
Bridgeport Machine Company, The 95
Brown Instrument Co.
Buckeye Traction Ditcher Co. 149
Byron Jackson Co. 27

Cameron Iron Works 65
Caterpillar Tractor Co. 19
Cavins Co., The 154
Chaplin-Fulton Mfg. Co., The 137
Chapman Valve Mfg. Co., The 71
Chemical Process Co., Inc.
Chiksan Oil Tool Co., Ltd.
Clark Bros. Company 93
Cleveland Trencher Co., The 141
Continental National Bank, Fort Worth 122G
Continental Supply Co., The 117
Cook, C. Lee, Mfg. Co. 140
Cooper-Bessemer Corp., The 49
Crane Co. 5
Cummins Engine Co. 6

Dodge Mfg. Corp. 148
Dowell, Incorporated 21

Eastman Oil Well Survey Co.
Elliott Core Drilling Co. 119
Ensign Carburetor Co., Ltd. 150

First National Bank, Fort Worth 122G
Fort Worth National Bank 122G
Franks Mfg. Co. 152
Frick-Reid Supply Corporation 125

Gaso Pump & Burner Mfg. Co. 53
General Electric Co.
Geoanalyzer Corp.
Gott, H. P., Mfg. Co. 153
Guiberson Corporation
Gustin-Bacon Mfg. Co.

Halliburton Oil Well Cementing Company Back Cover
Hazard Wire Rope Division of American Chain & Cable Company, Inc. Inside Back Cover
Hercules Tool Co.
Hough, Chas. N., Mfg. Co. 151
Hunt Tool Company 142
Hyatt Roller Bearing Co. 2

International Derrick & Equipment Company
International Harvester Company of America
International Supply Company 24

Jarecki Mfg. Company
Jensen Bros. Mfg. Co. 138
Johns-Manville 132 and 145
Johnston, M. O., Oil Field Service Corporation
Jones & Laughlin Steel Corp. 9

Kobe, Incorporated 32

Lane-Wells Co. 103
Leschen, A., & Sons Rope Co. 12
Lincoln Electric Company
Linde Air Products Co., The 79
Link-Belt Company 152
Lone Star Cement Corp. 61
Lufkin Foundry & Machine Co. 47

MacClatchie Mfg. Co.
Macwhyte Company 3
Marley Company
Martin-Decker Corp. 130
Mason-Neilan Regulator Co. 104
Mepham, Geo. S., Corp. Inside Front Cover
Merco Nordstrom Valve Co. 81-82
Metric Metal Works 10
Miller Sand Pump Co. 142
Mission Mfg. Co. 121
Moore, Lee C. & Co.

National Bank of Tulsa 122C
National Supply Companies, The 4
National Tube Co. 131
Natural Gas Equipment Co. of Texas 113
Natural Gasoline Association 133
Norvell-Wilder Supply Co. 76

Oakite Products, Inc. 141
Oil Center Tool Co. 73
Oil Well Supply Co. 97
Oklahoma Gas & Electric Co. 122E
Otis Pressure Control, Inc. 144
Oxweld Acetylene Co. 79

Parkersburg Rig & Reel Co.
Patterson-Ballagh Corporation 23
Petroleum Electric Power Club
Petroleum Rectifying Co. 51
Pittsburgh Equitable Meter Co. 81-82
Preformed Wire Rope 8
Prest-O-Lite Company, Inc., The 79

Rector Well Equipment Co.
Reed Roller Bit Company 68-69
Republic Steel Corporation 56-57
Ridge Tool Co. 109
Rieber Laboratories 31

Shaffer Tool Works 1
Smith, A. O., Corp. 106-107
Smith, E. M., Company 105
South Chester Tube Co.
Spang & Company 134
Sperry-Sun Well Surveying Co. 143
Staynew Filter Corp. 99

Texas Electric Service Co. 122A
Titusville Iron Works Company 17
Tretolite Company Front Cover
Trimont Manufacturing Co. 45
Trinity Portland Cement Co. 55
Tulsa Hotel 151

Union Carbide & Carbon Corp. 79
Union Carbide Sales Co. 79
Union Wire Rope Corporation 111
U. S. Steel Corporation Subsidiaries 7, 97 and 151
United Supply & Mfg. Corp. 143
Universal Atlas Cement Co. 7

Vernon Tool Co., Ltd. 115

Waukesha Motor Co.
Westcott & Greis, Inc. 87
Williamsport Wire Rope Co. 59
W-K-M Company, Inc. 72
Worthington Pump & Machinery Corp., Carbondale Division 137

Young Engine Company 149
Yougstown Sheet & Tube Co. 63